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INVESTIGATIONAL REPORT No. 26

THE SOUTH AFRICAN PILCHARD

(Sardinops ocellata)

SIZE COMPOSITION OF THE COMMERCIAL CATCHES, 1950-55

BY

D. H. DAVIES, M.Sc., Ph.D.

(Senior Professional Officer)

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1. Summary.

This is a further paper in a series dealing with the general biology of the South African pilchard, *Sardinops ocellata* (Pappe), and is a study of the size composition of the commercial catches of pilchards made off the coasts of the Union of South Africa during the period March, 1950, to December, 1955.

A short introduction is followed by a description of the commercial method of fishing for pilchards and how representative samples were taken and worked. There follows a general assessment of the sampling of the commercial catches after which their size composition is considered in relation to various factors such as season, sex and area.

The findings from this study are briefly as follows:—

(1) The present system of sampling of the commercial catches, consisting of two 50-fish samples each taken from one boat every fishing day, gives an accurate representation of the *commercially-fished* population of pilchards off the west coast.

(2) The commercial catches of pilchards off the west coast of the Union of South Africa are dominated by certain size-groups which pass through the fishery.

(3) The maximum time for the passage of a single size-group through the fishery appears to be approximately three years for both male and female pilchards.

(4) Due to the absence of the smaller-sized groups in the fishery in the years 1953 to 1955, it is possible that there will be a scarcity of pilchards of commercial size in the years 1956 to 1958.

(5) A tentative estimate of the rate of growth of pilchards, based on the passage of dominant size-groups through the fishery, is given as approximately 0·5 cm per year for male and female fish between the lengths of 20·5 cm and 22·4 cm.

(6) Since 1953 when pilchard catches in South West Africa reached a maximum, pilchard catches in the Union have been poor and the average size of the fish has decreased. It is likely that the two fisheries are connected and that fishing in South West Africa is having an adverse effect on the South African fishery.

2. Introduction.

This report is the eleventh in a series dealing with the biology of the South African Pilchard (*Sardinops ocellata*) and its environment.

The pilchard is distributed from Angola off the west coast to Durban off the east coast, representing a range of over 2,000 miles. Commercial exploitation takes place off Angola (25,000 tons per year), South West Africa (over 250,000 tons per year), the west coast of the Union of South Africa (135,000 tons per year) and to a negligible extent (up to 25 tons a year) off the east coast of the Union (see Fig. 1).

This investigation comprises an analysis of the commercial catches of pilchards in relation to size, as indicated by length, for the period March, 1950 to December, 1955 and is based on regular sampling carried out at certain of the landing places for pilchards off the west coast of the Union of South Africa (see Fig. 1). Age determination studies have been made during the same period but the data collected have not yet been finally analysed. It is intended to follow this investigation with a report on the age determination of the pilchard by means of scales and otoliths. It should then be possible to combine the data on size, age, rate of growth, etc. and thus make a more comprehensive assessment of the composition of the commercial catches.

It will be noticed that there has been no attempt to assess the size composition of the entire pilchard population of this area, because it is not known what relation the commercial catches bear to the population. There is no doubt, however, that the commercial catches provide the best means of sampling pilchards and if sampling on a similar scale were possible in the other areas off the coast of Angola, South West Africa and the east coast of the Union, the combined results would be of very great value in assessing the composition of the entire population(s) of the South African pilchard.

It is of interest to record that similar sampling of the commercial catches off the coast of South West Africa has been in progress, although on a smaller scale, for two years, and in the near future

the research programmes of South West Africa and the Union of South Africa are to be combined. It is hoped that as soon as this integration of programmes has been effected the frequency of sampling in the two areas will be brought to the same level.

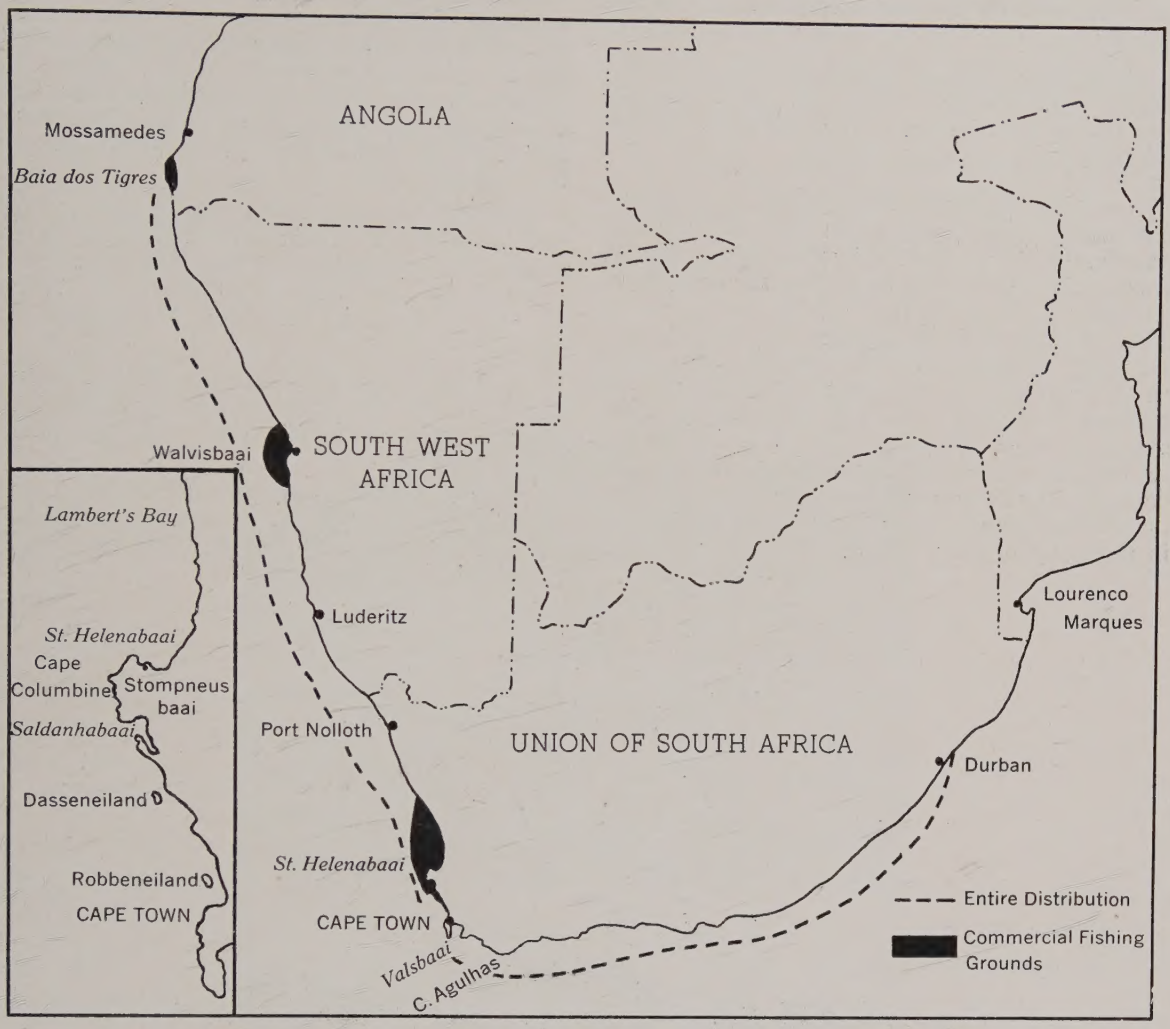

FIG. 1 DISTRIBUTION OF THE SOUTH AFRICAN PILCHARD.

Trigsurvey, 1957. Government Printer, 1957.

Intensive sampling of pilchards off the east coast (Natal) is carried out by this Division each year during the brief appearance of the shoals in the month of June.

There is no knowledge of any sampling of the commercial catches of pilchards off the Angola coast for purposes of research.

It may be stated, therefore, that sampling of the commercial catches of pilchards off the west coast of the Union of South Africa and South West Africa is carried out regularly in a manner which enables the data collected to be directly compared. The types of nets used in these two areas are identical, being the lampara in both cases. While the sampling of the pilchards caught off the east coast is carried out in a similar manner, the nets used for commercial catching are not the same as those used off the west coast. The gear used for the catching of pilchards off the Natal coast is the beach seine or *trek* net which is operated by means of a surf-boat through the breakers and close to

the shore. In consequence the data collected on pilchards from the east coast are not strictly comparable with that from the west coast samples, but have nevertheless been compared on a limited basis.

In addition, regular sampling of juvenile pilchards between Cape Town and Lambert's Bay (see Figure 1), is carried out by means of a blanket net (Radovich and Gibbs, 1954).

It is likely, therefore, that changes in the natural abundance and composition of the pilchard population will be reflected by fluctuations in these commercial catch samples and in the samples of juvenile pilchards obtained off the west coast on a regular basis with the blanket net. In any case, sampling involving the use of the commercial catches provides a far greater coverage of the pilchard population than any organized research sampling could offer, and there is no doubt that an accurate assessment of the composition of the commercially-fished population of pilchards, based on efficient sampling, is of fundamental importance in the study of the pilchard.

3. The Sampling of the Commercial Catches.

(i) General.

At the start of the Pilchard Research Programme a system of sampling of the commercial catches had to be devised in such a manner that it would give a true representation of the commercial catches whenever they were made, and at the same time provide an amount of work within the capacities of the personnel available for this aspect of the research.

It was by no means easy to devise such a system but considerable benefit was derived from the publications of those who had worked so extensively on the California sardine, viz. W. F. Thompson, O. E. Sette, F. N. Clark, J. C. Marr and others.

Sampling of the commercial catches of the pilchard off the west coast of the Union of South African began in March, 1950, and was carried out as follows:—

Two shore stations, Lambert's Bay and Stompneusbaai, situated at the northern and southern extremities of the St. Helena Bay area (see Fig. 1),

FIG. 2.—Typical South African West Coast Pilchard Boat.

[*Photo*: *S.A. Shipping News.*

were selected. Daily sampling of the commercial catches from these *two* stations was carried out from March, 1950, to February 1953. From February, 1953 onwards sampling was continued at the south station only, but at this station the rate of sampling was doubled so that there would be no loss of sampling intensity. The reasons for the closing down of the Lambert's Bay station were that it was far more convenient to maintain contact with a single station, fewer catches were landed at Lambert's Bay than at Stompneusbaai and catches landed at the two shore stations were invariably caught in the same area.

A comparison was made of the samples collected at Lambert's Bay and Stompneus, respectively, over a period of two years, and detailed statistical analysis of these data showed that there was *no significant difference between the composition of the pilchard population as shown by the samples taken at the two shore stations.*

The closure of the northern station at Lambert's Bay was therefore considered to be no loss and the sampling data collected at this station were included with that collected at Stompneus during the same period.

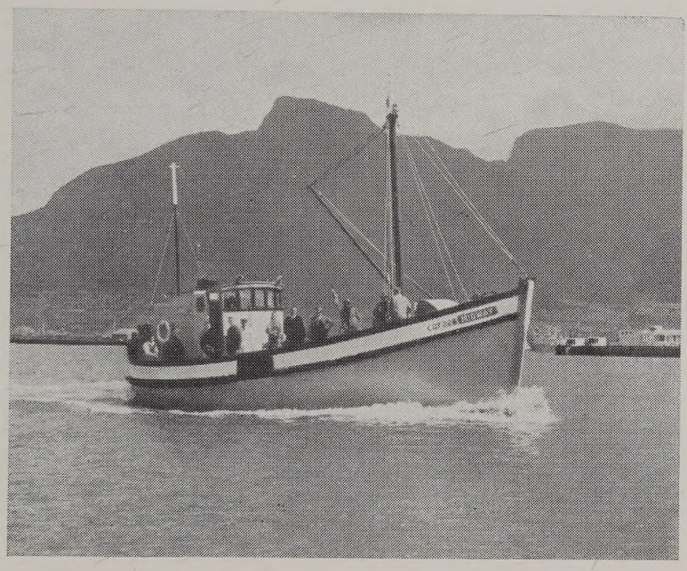

FIG. 3.—Typical West Coast Fishing Boat.

[*Photo*: *S. A. Shipping News.*

(ii) Commercial Catching of Pilchards.

(a) The Vessels.

All samples of pilchards taken in the course of the research programme were taken from commercial catches and not directly from the population and are consequently sub-samples or samples of samples of the population. For this reason it is most important to be able to determine the ultimate accuracy of any population estimate derived from such data, i.e. the extent to which the sampling gear takes a representative sample of the pilchard population. Some assessment of the selectivity and catching efficiency of the commercial fishing gear is therefore required, but at this stage it is not known how such an assessment could be made. A description of the catching of pilchards, including the gear used off the west coast by commercial fishing boats, may nevertheless provide a basis for such an assessment.

From 31st January, 1953, the number of boats in the west coast pilchard fishery centred in St. Helena Bay was limited on the basis of the total hold capacity of the boats at that time. According to the boat register 225 boats were operating as at February 1956; of these, 208 were fishing for the factories of the west coast and 17 were catching privately for bait, fish hawkers, etc.

There is at present a very strong tendency for the total number of boats in the pilchard fishery to become less. This is due to the fact that larger vessels have been found to be more suitable for the conditions off the west coast. There are still

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(June, 1956), boats as small as 35 feet in overall length operating, but when replacements become necessary two small boats are usually replaced by a single large vessel with catching and hold capacity equivalent to that of the two small ones together. Before long, complete replacement will have been effected and the fishery will be equipped with boats of almost standard design and average overall length of between 50 and 60 feet.

The boats of the west coast pilchard fishery are motor fishing vessels with the wheel-house and superstructure placed aft and the mainmast forward. The winch is placed just forward of the wheel-house, the gear is operated over the side and the catch is handled on the foredeck. The hold lies below the foredeck. Typical examples of west coast pilchard boats may be seen in Figs. 2, 3, 4 and 5.

FIG. 4.—Typical South African West Coast Pilchard Factory.
[*Photo*: *S.A. Shipping News.*

In order to give a further idea of size, the following dimensions of a typical west coast pilchard boat are given:—

Overall length: 52 feet.
Breadth: 17 feet.
Depth: 6 feet 6 inches.
Gross tonnage: 26 tons.
Hold capacity: 70 tons.
Powered by: 88 h.p. diesel motor.
Total crew, including skipper: 10.
Value of boat: £10,000.
Value of gear: £800.

It is of interest to note that these boats are of completely different design to those of the California sardine fishery. The latter have the wheelhouse and super-structure situated right forward, the mainmast approximately amidships and the after-deck clear for working the nets and landing the catches.

(b) The Gear.

The type of net used to catch pilchards off the west coast of the Union of South Africa is basically the lampara. The lampara consists of a central bag with plenty of bunt made up in panels of heavy cotton which varies in thickness from bottom to top (12 thread becoming heavier to 18 thread), and wings made with thread which becomes progressively lighter from the bag outwards (12 thread becoming lighter to 6 thread). The mesh is standard throughout the net and is fixed at $1\frac{1}{2}$ inches. There is a cork-line and a lead-line and the average total length of the net when made up is 160 fathoms. The net hangs to a depth of 20 fathoms at the centre and decreases in depth outwards on the

FIG. 5.—A Deck-load of Pilchards being discharged at the Jetty.

[*Photo*: *S.A. Shipping News.*

wings to 13 fathoms. Below the lead-line are vertical lines, spaced 2–3 fathoms apart which hang to a depth of 1 fathom and connect the lead-line to the hauling line by means of rings at the lower ends. The hauling line passes through the rings along the wings and is joined to the bottom of the bag. When a catch is made, both wings are pulled in rapidly and the hauling line is pulled in in advance of the cork line, causing rapid closure of the net underneath due to the presence of the rings and the quicker hauling from below, and giving a scoop-like shape to the net. A plan of the general lay-out of a typical west coast lampara net is shown in Fig. 6.

The gear used to catch the California sardine is also different from that used for the South African pilchard. In California the purse seine net is the most frequently used. This differs from the lampara in that it has no bag, has uniform mesh and thread, and is operated by the pulling in of one wing and the closing of a purse line with rings (Scofield, 1951).

Fishing for pilchards in South African waters is largely confined to nights when there is no moon although daylight fishing with the aid of echo sounders has recently been attempted. The shoals are then near the surface and their movement is spotted by a look-out who remains in the bow of the boat. The movement of a shoal causes the disturbance of phosphorescent planktonic organisms which is easily seen by the look-out. One end of the net is left with a dinghy and the shoal is rapidly encircled by the boat paying out the net all the time. The net is then hauled in rapidly and the catch brailed out into the hold of the boat.

Hauls are repeated until the boat is filled, when the catch is taken to the factory (see Fig. 4). Offloading at the jetty is carried out by means of water flooding and suction pumps (see Fig. 5). The fish are then conveyed to the plants by means of flumes.

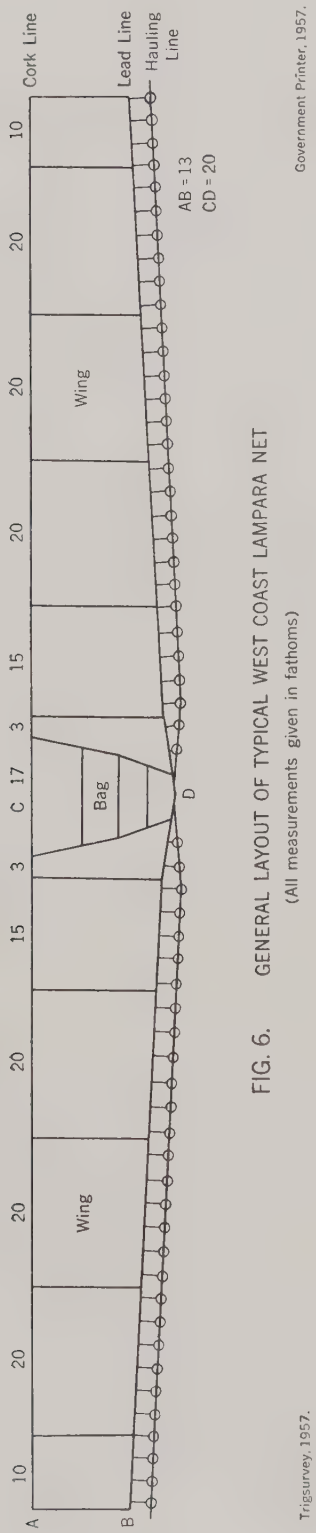

FIG. 6. GENERAL LAYOUT OF TYPICAL WEST COAST LAMPARA NET
(All measurements given in fathoms)

Pilchards are caught during the " sardine run " off the coast of Natal on the east coast during the month of June each year. The shoals usually appear close to the shore and swim at or near the surface where they are preyed upon by game fish and gannets. Commercial catches are made by Indian fishermen using surf-boats and beach seine nets during the day time only.

When the shoal has been spotted the boat is rowed rapidly and deftly through the surf and at the same time the net is paid out over the stern. In this manner the shoal becomes encircled and the boat returns to the shore through the surf when the net is pulled in.

The dimensions of a typical Natal Indian beach seine net used for catching pilchards off the east coast are as follows:—

Overall length of net: 300 ft.
Depth of net: 20 ft.
Length of bag: 25 ft.
Depth of bag: 18 ft.
Size of mesh of bag: $\frac{1}{2}$ inch.
Size of mesh in wings: 2 inches decreasing to 1 inch at the bag.

The catch is disposed of either at the beach or is transported to the Durban market and sold at the rate of 2s. 6d. to 3s. 0d. per dozen. West coast pilchard catches are sold by the fishermen at the rate of approximately £4 per ton.

(iii) Frequency of Sampling.

The basic plan for the sampling of the commercial catches of pilchards was to take two 50-fish samples a day. As far as possible this plan was adhered to, but many factors were responsible for upsetting the continuity of daily sampling on this basis. These factors included the period during each month when the bright moon caused the pilchards to remain at greater depths at night and so prevented their being caught, bad weather conditions, scarcity of pilchards, the presence of other fish in large quantities such as maasbankers, mackerel or round herring, the fluctuations in the demand for pilchards causing the factory managements to issue specific instructions that, for example, maasbankers only should be caught for a certain period, a closed season for pilchard fishing, etc. From Table 1 it will be seen that the maximum number of days during any one month in the period 1950–55 when pilchard samples were obtained, was 18 and the mean number 9·2.

Because the movements of pilchards, and in consequence pilchard fishing in general, are directly affected by the moon, research has been planned

and executed on a basis of lunar rather than calendar months by certain organisations, notably those connected with the California sardine. All research on the South African pilchard was, however, planned on a basis of calendar months.

Assuming that a maximum of four days on either side of the date of full moon may be lost to pilchard fishing each month, a total of 8 days may be lost every month depending on when the date of full moon occurs. In practice, the number of days lost before and after the date of the full moon varied between two and four and was affected by other factors such as the weather, time of the week-end, holidays, etc.

The dates of full moon for the years 1950–56 are scheduled in Table 2 and the maximum possible number of days lost to fishing each month due to bright moon are shown in Table 3. It will be seen that the mean of the maximum number of days lost per month during each year varies very little, i.e. from 8·0 to 8·7 days, and that the maximum range of monthly values is comparatively low, viz. 3.

It is evident therefore that the use of the calendar month, which was originally chosen as a basis for all sampling from the start of the pilchard research programme in 1950 in order to coincide with the arrangement of research work at sea, factory returns, etc., has had no adverse effect on the collected data. The calendar month will be used as a basis for all future work.

(iv) Daily Routine.

On every pilchard fishing day, a random sample consisting of 50 fish was taken by the shore biologist from the catch of a commercial fishing boat in the act of discharging its catch at the jetty. The sample was taken directly from the hold of the boat or from the centre of the pile of fish on deck by means of a scoop and placed in a large bucket. The time and the position of catch were obtained from the skipper. The bucket usually contained about 60 fish and the first 50 were counted out to form the sample to be examined. All damaged individuals were discarded.

In practice, each of the two biologists collected and worked one 50-fish sample of pilchards every day that fish were caught. The treatment of each pilchard sample was as follows:—

(1) The standard or body length from the tip of the snout to the end of the caudal peduncle (with the scales removed) was taken by means of a specially designed measuring board.

(2) The total length—from the tip of the snout, to the ends of the caudal fin pressed together so that the outer edges were parallel to the longitudinal axis of the body—was taken. Any fish with a distorted or broken caudal fin was discarded.

(3) The total weight* of the fish was taken.

(4) The alimentary system was removed and examined in relation to feeding studies.

(5) The gonads were examined, weighed and given an index of sexual activity.

(6) A vertebral count of six fish per sample was made.

(7) Scales were removed and otoliths extracted from six fish per sample for age determination studies.

Each sample was written up on a specially printed form designed to embody the full particulars of fifty fish. The length measurements were carefully read in order to detect gross errors. This was made possible by the experience of the biologists doing the sampling who could spot big errors in one or other of the length measurements with comparative ease.

4. Assessment of Sampling.

It was decided at the start of the pilchard research programme that sampling from the commercial catches should be carried out as frequently as possible and that samples should be taken at two places situated as far as possible at the northern and southern extremities of the commercial fishing area. It was hoped that in this manner adequate coverage of the commercially-fished population of pilchards would be obtained from the points of view of time and space.

As has already been described in this paper, sampling finally became resolved into the following form: viz. two samples of 50 fish were taken daily at one place during the period in each month when the moon was dark. The fact that sampling became restricted to the southerly station had little effect on the representation of the area in which the commercial catches were made as in the majority of cases boats from all the factories made their catches in the same area each night.

* A beam type of balance was first used but this was replaced by a direct reading Mettler balance which was quicker and more accurate.

In order to ascertain whether the samples taken were obtained from a single homogeneous population, the largest number of samples taken consecutively during the period 1950–55 was subjected to an analysis of variance. Altogether seven consecutive samples were obtained and male and female fish were treated separately.

In order to ascertain whether the present method of sampling could be improved upon, a statistical comparison was made between a series of 5 samples taken in the normal manner each from the catch of a single boat *and* a series of 5 samples each of which had been taken from the catches of five different boats.

(i) To test whether the Samples came from a Homogenous Population.

In order to discover whether the seven consecutive samples showed any significant variation between themselves, the standard lengths of male and female fish taken separately from each sample were extracted (see Tables 4 & 5) and subjected to an analysis of variance.

For convenience an amount of 20 cm was subtracted from all the readings.

For Female Fish (see Table 4).

The numbers of length measurements per sample were 34, 25, 32, 35, 27, 35 and 28 giving a total of 216.

ANALYSIS OF VARIANCE.

Source of Variation.	Sums of Squares.	Degrees of Freedom.	Variance Estimate.
Between samples	8·84	6	$\frac{8\cdot84}{6}=1\cdot47$
Within samples	131·88	209	$\frac{131\cdot88}{209}=0\cdot63$
Total.....	140·72	215	

Applying Snedecor's F test:—

$$F\ (6,209) = \frac{1\cdot47}{0\cdot63} = 2\cdot33.$$

∴ The difference is significant at the 5% level.

For Male Fish (see Table 5).

The numbers of length measurements per sample were 16, 25, 18, 15, 23, 15 and 22 giving a total of 134.

ANALYSIS OF VARIANCE.

Source of Variation.	Sums of Squares.	Degrees of Freedom.	Variance Estimate.
Between samples	3·78	6	$\frac{3\cdot78}{6}=0\cdot63$
Within samples	68·83	127	$\frac{68\cdot83}{127}=0\cdot54$
Total.....	72·61	133	

Applying Snedecor's F test:—

$$F\ (6,127) = \frac{0\cdot63}{0\cdot54} = 1\cdot16.$$

∴ The difference is not significant at the 5% level.

(Significance level is approx. 40 per cent).

The two levels of significance for female and male pilchards, 5 per cent and approximately 40 per cent, were then combined into a single level of significance by a method of Fisher (Snedecor, 1950). The result of this combination was almost exactly 10 per cent.

Thus, using the 5 per cent level as a criterion, it can be accepted that the samples came from a uniform population.

Two further tests were applied: firstly, a test was made to find out whether the ratio of sexes (Davies, 1956a) differed significantly between samples. It was found that it did not. Secondly, it was found that there was no significant correlation between the mean female length and the mean male length for each sample.

It may therefore be accepted that the seven samples came from a single homogeneous population of pilchards, and that in consequence the standard of sampling was sufficiently high to represent an accurate index of the commercially-fished population of the area.

(NOTE.—*The type of gear used for the commercial catching of pilchards does not affect the homogeneity of the samples, since the length range over which the net exercises no selection is far greater than the range of the seven samples*).

(ii) To test the Possibility of Improving the Present System of Sampling.

The present system of sampling used in the pilchard research programme consists of the daily collection and examination of two 50-fish samples each taken from a separate boat. This daily sampling is carried out during the period in each month when commercial fishing takes place, i.e. during the dark moon period and occupies the services of two biologists stationed at the Stompneus field station.

With a view to finding out the possibilities of improving the representation of the commercial catches by a better sampling system a test was made on five separate occasions on which an ordinary sample was compared with a sample obtained from the catches of five different boats.

The test sampling was carried out as follows:—

A single fifty-fish sample was taken from each of five boats in the usual manner. These five samples were then placed together in a container and were mixed well. From these a single fifty-fish sample was obtained by counting the fish and saving each fifth individual.

A normal fifty-fish sample was collected from a boat other than one of the five from which samples had already been taken.

Each biologist then proceeded to measure, weigh, sex, etc. the two samples in the usual manner except that they each did 25 fish and then exchanged samples. In this way the effect of personal bias would be eliminated, at any rate for purposes of comparison.

In order to compare the five one-boat with the five five-boat samples, the standard lengths in centimetres for male and female pilchards, separately, were extracted and tabulated (see Table 6). Standard length was chosen as the best measurement for comparison as it was least subject to variation. Total length varied in relation to caudal fin damage and was not as exact as the measurement of standard length, and weight was subject to excessive variation due to feeding and reproductive activities.

From these length data (see Table 6), an estimate of variance for every sample, males and females treated separately, was calculated and a comparison of variance made between one-boat and five-boat samples. If the five-boat samples were better than the one-boat samples then this would be reflected by the five-boat samples possessing a greater variance.

The variance was calculated from the formula:—

$$V = \frac{1}{n-1}\left[\Sigma x^2 - \frac{(\Sigma x)^2}{n}\right]$$

When.— V = the estimate of variance.
n = the total number of standard length measurements.
x = the length measurement for each fish.

The following table shows the calculated estimates of variance for the series of five tests:—

Sex.	Estimates of Variance.			
	Males.		Females.	
Type of Sample....	1-Boat	5-Boat	1-Boat	5-Boat
First Test.....	0·283	0·870	0·789	1·27
Second Test.....	2·62	1·81	2·77	2·14
Third Test.....	1·98	1·56	2·90	1·42
Fourth Test.....	1·56	2·75	1·85	3·55
Fifth Test.....	0·574	0·398	1·001	1·396

From these estimates of variance it is evident that the five-boat sample does not give a better representation of the commercial catches than the one-boat sample, as the variance of the two types of sample varies in a completely haphazard manner.

In the circumstances, therefore, it was decided to continue with the present system of one-boat sampling by which two fifty-fish samples are worked on every catching day.

(iii) Discussion.

Although any estimates of the pilchard population derived from these systems of sampling are at present limited by the lack of any accurate means of assessing the extent to which the commercial catches represent the entire population, it appears that at least the one-boat sample taken on every fishing day provides an accurate index of the commercially-fished population.

Unfortunately, these data are not supported by relevant statistics of catch and effort but a system for the collection of detailed information in relation to the catch of every boat in the fishery has been devised and will shortly be put into operation.

It is hoped that the combination of accurate sample data with relevant catch statistics will produce a significant advance in the study of the west coast pilchard population.

5. Dominant Size Groups in the Commercial Catches by Months, 1950–55.

On the basis of the sampling of the commercial catches described above, the standard length frequencies of pilchard catches are given for each month in the form of tables (see Tables 7A to 12B inclusive) and graphs (see Plates 1–10) for the period March, 1950 to December, 1955. Male and female fish were treated separately (see Plates 1–7) and together (see Plates 8–10).

Length frequencies were compiled for each length group per month and then expressed as percentages of the total number of fish sampled during the month. Lengths were grouped into 5 mm length groups and plotted graphically without smoothing. The total numbers of fish examined per month are shown on every graph and where a total was less than 100, graphs were represented by means of dotted lines and were not taken as an accurate reflection of the length composition of the catches.

Odd samples were obtained during the closed season for commercial fishing with set-nets belonging to the fisheries research vessels. These samples have been included due to lack of other data during certain months but are *not* comparable with the other length frequency data. Samples obtained in this manner are marked on the graphs as set-net samples.

Samples were also obtained from commercial catches made in False Bay, usually in the month of December. The length frequencies of these samples are comparable with the others and are of considerable interest. They are considered separately in Section 7 below.

In considering the composition of the commercial catches of pilchards off the west coast, it is evident that all catches are affected by the presence of definite dominant size groups. The presence of these dominant groups has the greatest effect on the composition of the commercial catches. For this reason the analysis of the size composition of the commercial catches has been restricted to the examination of the dominant groups only. These groups have been designated by letters for the sexes separately and by numbers when the sexes were treated together.

(i) Males.

(a) 1950 (see *Tables* 7 (*a*), 7 (*b*) *and Plate* 1, *fig.* 1).

The commercial catches of male pilchards were dominated during 1950 by group A which was present during every month from March through to December. The presence of a second sub-dominant mode, designated group B, was evident from April to December, and less clearly defined groups of smaller size than group B were represented during most months.

(b) 1951 (see *Tables* 8 (*a*), 8 (*b*) *and Plate* 1, *fig.* 2).

Group A continued its dominance from December, 1950, through to April, 1951, after which it disappeared. It was dominant in the catches for a total period of 1 year and 2 months.

In May two size groups suddenly became prominent, viz. what was probably a continuation of group B from the previous year and a third group, group, C. Group B continued from May through to December when it disappeared. Group B was recorded in the catches for a period of 1 year and 5 months.

Group C was present in the catches in February, was absent in March, and was dominant in May, June, August, October, November and December. The modes of groups B and C became displaced in August. A fourth group, group D, appeared as a small mode in November and continued in December.

Smaller-sized groups were present during certain months.

(c) 1952 (see *Tables* 9 (*a*), 9 (*b*) *and Plate* 2, *fig.* 1).

Group C continued from the previous year and remained dominant throughout 1952. Group D, which started in November of the previous year, continued as a sub-dominant group throughout the year but tended to decline towards the end of the year.

Smaller-sized groups were present during some months of the year.

(d) 1953 (see *Tables* 10 (*a*), 10 (*b*) *and Plate* 2, *fig.* 2).

Group C continued through from the previous year but only as a rapidly declining mode which disappeared finally in the set-net samples obtained in October. Group C was dominant in the catches for a total period of one year and present in the catches for 2 years and 7 months.

During December catches were made in False Bay and consisted mainly of a smaller class of fish. It is interesting to note that fish of the same size as Group D were caught.

Group D became the dominant group during 1953 and continued throughout the year.

There was considerable evidence of the presence of smaller-sized groups during the year.

(e) 1954 (see *Tables* 11 (*a*), 11 (*b*) *and Plate* 3, *fig.* 1).

Group D continued to be strongly dominant throughout the year up to November, and was the only group of any magnitude. Signs of smaller-sized groups were evident.

(f) 1955 (see *Tables* 12 (*a*), 12 (*b*), 6 (*b*) *and Plate* 3, *fig.* 2).

During 1955 a group similar to Group D dominated the catches. It was thought at first that this was a continuation of group D, but the mode was at a smaller length. Group D was therefore present in the catches for a total period of 3 years and 1 month and was dominant for 2 years.

There is no evidence of a large new group coming on in 1954 and it is surprising that so pronounced a group should appear and dominate the 1955 catches without having been continued from the previous year.

Possibly the small modes seen in 1954 mark the beginning of the dominant group, group E of 1955, but it seems more likely that this group came in from another area.

Hardly any signs of the presence of smaller-sized groups are to be seen in the graphs for 1955.

TABLE SHOWING DOMINANT* AND SUB-DOMINANT† GROUPS OF MALE PILCHARDS IN THE FISHERY, 1950–55.

Year.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1950	—	—	A	bA	bA	bA	bA	bA	bA	bA	bA	bA
1951	A	cA	A	cA	Cb	Cb	cB	CB	cB	Cb	dCb	dCb
1952	dC	DC	dC	dC	dC	dC	dC	dC	—	d	dC	—
1953	Dc	Dc	Dc	Dc	D	Dc	Dc	Dc	D	D	d	—
1954	D	D	eD	eD	D	D	eD	D	D	D	D	—
1955	—	E	E	E	E	E	E	E	E	E	E	—

* Indicated by capital letters.
† Indicated by small letters.

(ii) Females.

(a) 1950 (see *Tables* 7 (*a*), 7 (*b*) *and Plate* 4).

During 1950 the commercial catches of female pilchards were dominated by a single group (group A), which produced a mode from March through to December.

Marked evidence of large numbers of fish of smaller size than the main group may be seen from the graphs during the year from March to December.

(b) 1951 (see *Tables* 8 (*a*), 8 (*b*) *and Plate* 5, *fig.* 1).

Group A continued to dominate the commercial catches from December of the previous year through to September, 1951. In October it became sub-dominant, was again dominant in November and appeared for the last time in December.

Group A was dominant in the catches for a period of 18 months and was recorded during a total period of 1 year and 9 months.

During the year a second group (group B), began in January and increased rapidly in size to become dominant in October (according to set-net catches) and was dominant in commercial catches in November.

A third group (group C) appeared in October and continued through to December.

(c) 1952.

Group A apparently did not continue through into 1952. Group C did, however, continue from the previous year, became dominant in the commercial catches in February and continued its dominance through to August. By November group C had taken second place to another group (group D).

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Group C was recorded in the catches for a total period of 1 year and 3 months and during this period it was dominant for 8 months.

Group D appeared as a new group in January and continued through to November without becoming dominant.

Another group (group E) appeared in February and March.

(d) 1953 (see *Tables* 10 (*a*), 10 (*b*) *and Plate* 6, *fig.* 1).

Group C appeared as a declining group during January and February and then disappeared.

A new group (group E) appeared as the dominant group in January. This group continued through to October but was only dominant for the first 3 months. Group E was not recorded in the set-net catches made during the closed season. A further group (group F) appeared in March, became dominant in May and continued throughout the year.

During December, catches were made in False Bay and consisted mainly of a much smaller class of fish. It is interesting to note that fish of the same size as group F were caught.

Groups of smaller-sized fish were recorded during the year.

(e) 1954 (see *Tables* 11 (*a*), 11 (*b*) *and Plate* 6, *fig.* 2).

Group E continued from the previous year through January but disappeared in February. This group was recorded in the catches over a total period of 1 year and 3 months and was dominant for 5 months.

Group F continued from 1953, became dominant in February and continued its dominance through to October and was present in November. During the closed season of August and September when few samples were obtained, the mode became displaced. By November the F group began to decline but continued in December.

In December, catches were made in False Bay and consisted of smaller fish. Fewer groups of smaller-sized fish were recorded during this year than in previous years.

(f) 1955 (see *Tables* 12 (*a*), 12 (*b*) *and Plate* 7).

In February, group F reappeared and was dominant in the catches. It declined in March, became dominant again in April, varied considerably from May to August, became dominant again in September and then declined in October and November.

Group F was recorded in the catches over a total period of 2 years and 10 months and was dominant for 17 months.

Group G began in February, became dominant in March and remained dominant (except for April and September) through to November.

This year was characterized by an almost complete absence of the smaller-sized groups.

TABLE SHOWING DOMINANT* AND SUB-DOMINANT† GROUPS OF FEMALE PILCHARDS IN THE FISHERY, 1950–55.

Year.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1950	—	—	A	A	A	A	A	A	A	A	A	A
1951	A	bA	bA	bA	bA	BA	bA	bA	bA	cBa	cBa	Cba
1952	—	edC	edC	dC	dC	dC	dC	dC	—	d	dc	—
1953	c	Ec	fE	fE	Fe	Fe	Fe	Fe	Fe	fE	—	—
1954	fE	Fe	F	F	F	F	F	F	F	F	f	f
1955	—	gF	Gf	gF	Gf	Gf	Gf	Gf	F	f	f	—

* Indicated by capital letters.
† Indicated by small letters.

(iii) Males and Females Combined.

(*See Tables* 7 (*a*) *to* 12 (*b*) *inclusive and Plates* 8, 9 *and* 10).

During the period March, 1950 to December, 1955 the graphs of the combined length frequencies of male and female pilchards in the commercial catches showed the passage of a number of dominant groups through the fishery.

In this period a total of six dominant groups was apparent. These groups have been designated I–VI.

Group I was present at the start of the sampling of the commercial catches in March, 1950, (see Plate 8, fig. 1). This group was dominant in the catches from March, 1950, to April, 1951, when it disappeared. The total period of dominance in the catches of group I was 1 year and 2 months.

Group II did not appear very prominently in April, 1951 (see Plate 8, fig. 2), had already begun to decline by September and disappeared in December. This group was recorded in the catches for only 9 months.

Group III appeared immediately after group II, i.e. in May, 1951 (see Plate 8, fig. 2), and continued through to December when it disappeared after only 8 months in the fishery.

Group IV appeared in October, 1951 (see Plate 8, fig. 2), continued through to the end of that year, was dominant right through 1952 (see Plate 9, fig. 1), declined in 1953 and finally disappeared in August, 1953 (see Plate 9, fig. 2). Group IV was recorded in the commercial catches over a total period of 1 year and 11 months.

Group V first appeared as a separate group in January, 1952 (see Plate 9, fig. 1). It continued throughout 1953 and 1954 but began to decline rapidly in November, 1954, and finally disappeared in March, 1955 (see Plate 10, fig. 2). Thus, group V was present in the commercial catches over aperiod of 3 years and 3 months.

The final group, group VI, first appeared in August, 1954 (see Plate 10, fig. 1) and continued to dominate the catches through to September, 1955 (see Plate 10, fig. 2). During October and November group VI showed a rapid decline. This group was recorded in the commercial catches over a period of 1 year and 3 months.

TABLE SHOWING DOMINANT* AND SUB-DOMINANT† GROUPS OF PILCHARDS (MALES AND FEMALES COMBINED) IN THE FISHERY, 1950–55.

Year.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1950	—	—	I	I	I	I	I	I	I	I	I	I
1951	I	I	I	2, I	3, II	3, II	3, II	3, II	III, 2	4, III, 2	IV, 3, II	IV, 2
1952	6, 5, IV	6, 5, IV	6, 5, IV	5, IV	5, IV	5, IV	5, IV	5, IV	—	—	5, IV	—
1953	—	V, 4	V, 4	V, 4	V, 4	V, 4	V, 4	V, 4	V	V	5	—
1954	V	V	V	V	V	V	V	V	6, V	6, V	VI, 5	VI, 5
1955	—	VI, 5	VI	VI	VI	VI	VI	VI	VI	6	—	—

* Indicated by roman numerals.
† Indicated by arabic numerals.

(iv) Discussion.

It is hoped that the analysis of the data on age determination will make it possible to separate the length groups mentioned above with far greater accuracy. In the meantime, however, it is of interest to record that during the period March, 1950, to December, 1955, a total of five groups of male pilchards moved through the fishery. Of these, the periods recorded in the catches for each group varied from 1 year and 2 months to over 3 years. The passage of only two groups, viz. groups C and D appeared to be a complete cycle within this period. The time of passage of these two groups through the fishery was 2 years and 7 months and 3 years and 1 month, respectively. It seems therefore, that *the maximum time taken for the passage of a dominant group of male pilchards through the fishery is approximately* 3 *years.*

The presence of groups of smaller-sized males varied considerably. During the years 1950 and 1952 groups of small-sized fish were most noticeable, in 1951 and 1953 present in certain months, in 1954 hardly present and during 1955 entirely absent.

During the same period (March, 1950–December, 1955) a total of 7 groups of female pilchards was recorded in the fishery. Of these, the periods during which the groups were prevalent in the catches varied from 7 months to 2 years and 10 months. This is very close to the maximum

duration of the male groups, viz. 3 years and 1 month. It is evident that *the maximum time taken for the passage of a dominant group of female pilchards through the fishery is also in the neighbourhood of* 3 *years.*

When male and female pilchards were treated together, the maximum duration of a combined group in the fishery was 3 years and 3 months. It seems likely therefore that *the maximum time taken for the passage of a dominant group through the fishery would be approximately* 3 *years.*

The presence of smaller groups varied considerably. In 1950 groups of small-sized females were most noticeable; in 1951, 1952, 1953 and 1954 present in certain months but in 1955 they were almost entirely absent. This occurrence was similar for male pilchards.

The absence of the smaller-sized groups of male and female pilchards in 1955 may be of considerable significance to the fishery in the years following as it may indicate that no new classes were available to replenish the fishery. If this were the case the effect would then be felt when the number of years of duration of group E (male) and group F (female) had expired, i.e. possibly 1956 or 1957. It will be of great interest to see whether there is a serious decline in the fishery in these years.

6. Dominant Size Groups in the Commercial Catches by Years, 1950–55.

After consideration of the length frequencies of pilchards from the commercial catches on a monthly basis with the sexes treated both separately and together, the data were treated on a yearly basis.

The length frequencies of male fish by the year are shown (see Plate 11, fig. 1), female fish by the year (see Plate 11, fig. 2) and males and females together (see Plate 11, fig. 3).

(i) Males.

(See *Plate* 11, *fig.* 1).

The dominant size group of male pilchards in 1950 (22·5 cm) continued as the dominant group in 1951 (22·8 cm). A sub-dominant group (20·5 cm) in 1950 continued as a sub-dominant group in 1951 (21·2 cm) and probably became the dominant group in 1952 (22·3 cm). The dominant group of 1950 and 1951 apparently disappeared after 1951.

A sub-dominant group in 1952 (19·8 cm) either disappeared or may perhaps have returned to the fishery as the dominant group of 1955 (21·8 cm).

Some decrease in the size of the dominant group in 1952 (22·3 cm) took place [c.f. main group for 1951 (22·8 cm)]. An even greater decrease in the size of the dominant group in 1953 (21·5 cm) took place. In this year no sub-dominant smaller groups were present. The 1953 main group continued into 1954 as the dominant group (22·3 cm) and 1954 was also characterized by the lack of sub-dominant groups of smaller size.

In 1955 the size of the dominant group fell sharply to 21·8 cm and may have had some connection with the sub-dominant group in 1952. The year 1955 was also characterized by an entire lack of sub-dominant groups consisting of smaller-sized fish.

(ii) Females.

(See *Plate* 11, *fig.* 2).

The dominant size group of female pilchards in 1950 (23·3 cm) continued as the dominant group in 1951 (23·3 cm). A sub-dominant group (21·1 cm) in 1950 continued as a sub-dominant group (21·8 cm) in 1951 and apparently became the dominant group in 1952 (22·4 cm). The dominant group of 1950 and 1951 apparently did not continue in the fishery.

A sub-dominant group in 1952 (20·2 cm) either disappeared or possibly returned as the dominant group of 1955 (22·3 cm). During the years 1953–1955 no sub-dominant groups of smaller-sized female pilchards were present.

The dominant group in 1953 (22·3 cm) apparently continued as the dominant group in 1954 (22·8 cm), but in 1955 continued as a sub-dominant group of larger-sized fish (23·2 cm). A new group of females (22·3 cm) appeared in 1955 and dominated the catches during that year.

(iii) Males and Females combined.

(See *Plate* 11, *fig.* 3).

When the length frequencies of male and female pilchards are considered together, it is evident that during 1950 and 1951 a single group, viz. group I was dominant in the fishery.

By 1952 this group had disappeared and had been replaced by group II which had started as a sub-dominant group in 1950 and continued throughout 1951.

Group III appeared in 1953 apparently without any previous connections, continued in 1954 and declined to become a sub-dominant group in 1955.

Group IV appeared as a sub-dominant group in 1952, continued in 1953 and 1954 and became dominant in 1955.

(iv) Six Year Average.

The percentage length frequencies for male and female pilchards per length group were combined and averaged for the six-year period 1950–55 (see Table 13) and plotted graphically against the length-frequency graphs of each year (see Plate 12).

It is evident that the dominant groups in the years 1950 and 1951 are of larger size than the six-year average, while from 1952 through to 1955 the dominant groups largely coincide with the six-year average. In 1955 the spread of the size groups is less than that of the six-year average.

From the length frequencies of male and female pilchards taken both separately and together it is evident that during the years 1950, 1951 and 1952 the dominant group was always followed by a sub-dominant group or groups of smaller size which in turn became dominant in the fishery.

From 1953 *to* 1955, *however, the fishery was characterized by a complete absence of these smaller-sized groups.* It will be of the greatest interest to determine the composition of the catch for 1956 as *there is no apparent source of supply for this year according to the evidence provided by the annual graph for the previous years* (see Plate 11, fig. 3), although it is possible that new groups will come in from other areas or that group IV will continue its dominance into 1956.

From 1950 to 1952 there is an obvious follow-through in the fish comprising group II (see Plate 11, fig. 3). This further suggests that a single group exists for a period of approximately three years in the fishery. It is important to examine this group from the point of view of growth.

For male pilchards (see Plate 11, fig. 1) this group appeared in 1950 at a modal value of 20·5 cm, in 1951 at 21·2 cm and finally as a dominant group at 22·3 cm in 1952. This showed that an amount of growth of 0·7 cm in the first year and 1·1 cm in the second year had taken place, i.e. a total of 1·8 cm. While it is most unlikely that more growth took place in the second year than in the first year, the overall growth is probably of the same order as the actual growth which took place.

For female pilchards (see Plate 11, fig. 2) this group appeared in 1950 at a modal value of 21·1 cm, in 1951 at 21·8 cm and finally in 1952 as a dominant group at 22·4 cm. This showed that an amount of growth of 0·7 cm in the first year and 0·6 cm in the second year had taken place, i.e. a total of 1·3 cm. It is unlikely that female pilchards would show less growth than males in the same period but this apparent overall growth may be of some importance as an indication of actual growth.

Examination of the graphs of length frequencies of male and female pilchards (see Plates 1–7) and extraction of monthly increments of growth gave a mean annual growth of 0·5 cm per year for male pilchards (within a length range of 20·0–22·5 cm), and 0·4 cm per year for female pilchards (within a length range of 21·0–22·5 cm).

(v) Discussion.

While rate of growth can only be dealt with when age determination studies have been completed, it may be stated that *preliminary indications show that the rate of growth of male pilchards of these size categories is approximately* 0·5 *cm per year and of female pilchards approximately* 0·4 *cm per year, giving a combined rate of growth of* 0·5 *cm per year.*

Another interesting point in relation to the length frequencies of pilchard catches during the period 1950–55 is the decrease in size of the dominant groups. For male fish there was an increase in the size of the dominant group from 1950 to 1951, but from 1951 to 1955 the size decreased from 22·8 cm to 21·8 cm, i.e. 1 cm. In 1954, however, there was an increase to 22·3 cm.

For female fish the size of the dominant group remained the same for 1950 and 1951 and from 1951 to 1955 the size of the dominant group decreased from 23·3 cm to 22·3 cm, i.e. by 1 cm. There was an increase in 1954 to 22·8 cm.

It is important at this stage to compare the total annual catches of pilchards for the Union of South Africa and South West Africa. Before making this comparison some indication of the lines on which the industry has developed and its legislative control is necessary.

By 1950 there were 13 factories on the west coast of the Union. Each factory consisted of a processing plant for fish meal and oil together with a cannery. In October of that year special legislation was promulgated with prohibited the erection of any more factories.

In 1950 a season closed to pilchard fishing was introduced. This closed season consisted of the two months September and October in the years 1950, 1951, 1952 and 1954. In 1953 the closed season was moved forward to October and November and no fishing for pilchards took place in December due to the absence of fish. The closed season was abolished in 1955 and has not been enforced since.

Apart from the closed season from 1950 to 1954 a further measure of control in the form of a total catch ceiling for pilchards and maasbankers combined was introduced with effect from 1953. This ceiling consisted of 250,000 tons total catch of both species together for each calendar year. In the period 1950 to 1955 this amount has been reached on only one occasion, viz. in 1952 when it was exceeded (300,560 tons).

Further control of the pilchard fishery of the Union in the form of the limitation of the total number of fishing boats in the industry from January, 1953, onwards has been mentioned previously in this paper [see Section 3 (ii)].

Although the total catch of pilchards in the Union's fishery may be thought to have been affected by the various control measures such as the limitation of the number of factories, the closed season, the total catch ceiling and the limitation of the number of boats, the figures in the table below show that the total annual catch of pilchards has never exceeded the amount of 187,424 tons obtained in 1952 when there was no catch ceiling or boat limitation.

If the effort involved in catching pilchards from 1950 to 1955 is considered in relation to (*a*) the number of factories operating, (*b*) the closed season, (*c*) the catch ceiling and (*d*) the limitation of boats, then from 1950 to 1952 (*a*), (*b*) and (*c*) were constant and (*d*) was increasing. Therefore it may be said that the effort increased during this period by virtue of the increase in the number of boats catching pilchards. During this period the annual catches of pilchards increased enormously (see the Table below and Plate 13).

In 1953 and 1954, however, effort in relation to (*a*), (*b*), (*c*) and (*d*) was constant in that the number of boats operating was fixed from 1953 onwards. Catching effort was not only constant but the greatest up to that time, yet the annual catches of pilchards declined sharply (see Table below and Plate 13).

In 1955 the effort was increased in that the closed season restriction (*b*) was removed while the other factors remained the same. The annual catch for this year was greater than in 1954.

In South West Africa the pilchard fishery is served by 6 factories situated at Walvis Bay. The number of factories is restricted to six as no new licences are granted. An annual catch ceiling of 250,000 tons of pilchards is in force but additional quotas are sometimes granted.

The following annual catch statistics for the Union and South West Africa are given for purposes of comparison.

Year.	Total Catch of Pilchards.	
	Union of South Africa.	South West Africa.
	Tons	Tons
1950.....	82,345	51,513
1951.....	109,610	140,200
1952.....	187,424	248,927
1953.....	150,987	289,090
1954.....	97,336	276,297
1955.....	134,424	250,417

It is interesting to note that from the time the South West African fishery reached its zenith in 1953, a sharp decline in the Union's pilchard catches occurred in spite of maximum catching effort in 1953 and 1954. Although the Union's catching effort was further increased by the removal of the closed season in 1955 no spectacular increase in annual catch occurred. South West African catches, on the other hand, fell slightly in 1954 and 1955 but nevertheless remained very high.

From the graphs (see Plate 11, fig. 3), it will be seen that there was a sharp decline in the size (as indicated by length) of the dominant group in 1952. This decrease continued through to 1955 when the size of the dominant group was approximately 1 cm less than that of the dominant group in 1951.

At the time of writing (August, 1956), there is no proof that the pilchard fisheries of the Union of

South Africa and South West Africa are connected. There are, however, a number of indications of such a connection (Davies, 1956 b), and *the decline in the annual catches of the Union together with the falling off of the size of the dominant groups once again not only suggests that the two fisheries are connected but also that the fishing in South West African waters is having an adverse effect on the Union's pilchard fishery.*

As stated in a previous report on the migration of the pilchard (Davies, 1956 b), the pilchards comprising the catches in South West African waters are generally smaller than those in the Union. They are therefore presumably younger and if they migrate southwards to Union waters at a certain stage in their growth then it would not be surprising that heavy fishing off the coast of South West Africa would have a marked effect on the Union's fishery.

Tagging alone will confirm the connection between the two fisheries and an extensive tagging programme is to begin early in 1957. If the fisheries are found to be connected *it may be necessary to review the present legislation and devise a new system of control for both fisheries* in such a manner that fishing in the one area does not adversely affect fishing in the other area.

7. Size Composition of the Commercial Catches in False Bay and off Natal.

In the period 1950 to 1955 commercial catches of pilchards in False Bay were made only during the month of December in the two years 1953 and 1954.

The 1953 catches (see Plate 9, fig. 2) consisted of fish of wide size range of approximately 14 cm to 24 cm in length. The majority of fish were smaller, however, and very few fell within the size range of fish caught in the commercial catches in the St. Helena Bay area.

The 1954 catches in False Bay (see Plate 10, fig. 1), were of smaller-size range than those of the previous year, and consisted generally of a larger class of fish of range approximately 19 cm to 24 cm which to some extent extended into the size groups normally caught in commercial catches in the St. Helena Bay area.

Although the catches of pilchards made off the coast of Natal (see Tables 14 a, b and c) are not comparable with those caught off the west coast due to the fact that the catching gear used in the two areas is quite different [see Section 3 (ii)], it is felt that the Natal catches are nevertheless to a large extent representative of the pilchard shoals present off the coast. It is therefore of interest to compare the size composition of the Natal pilchards with that of the west coast catches. For this purpose the six-year (1950–55) average graph of west coast catches was included in the graphs of the catches of Natal pilchards for the years 1951, 1954 and 1955 (see Plate 14).

From these it is evident that the Natal pilchards consist of fish of much smaller size than those caught off the west coast.

The question of the possible connection between the pilchards found in False Bay, off the Natal coast, off the west coast and in Walvis Bay (South West Africa) has been discussed in a previous paper (Davies, 1956 b).

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10. Appendix.

Tables of data on which text, figures and plates are based.

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TABLE 1.

NUMBERS OF SAMPLES* WORKED AND NUMBERS OF DAYS ON WHICH SAMPLES WERE OBTAINED, 1950–55.

Month.	Numbers of Samples worked per Month.						Mean.	Numbers of days on which Samples were obtained.						Mean.
	1950.	1951.	1952.	1953.	1954.	1955.		1950.	1951.	1952.	1953.	1954.	1955.	
January.....	—	3	3	2	6	—	4	—	3	3	1	6	—	3
February.....	—	5	15	12	4	9	9	—	5	10	10	4	6	7
March.....	1	12	20	12	6	32	14	1	9	14	12	5	15	9
April.....	16	15	23	5	10	5	12	9	12	15	5	6	4	9
May.....	28	21	20	6	17	10	17	18	16	12	6	9	6	11
June.....	27	17	20	12	11	18	18	16	11	15	11	11	10	12
July.....	16	29	27	11	13	11	18	11	17	18	10	7	5	11
August.....	28	20	17	9	†1	19	16	18	15	13	9	†1	11	11
September.....	13	†	†	9	†	24	15	10	†	†	9	†	13	11
October.....	9	†	†	†	†	1	5	8	†	†	†	†	1	5
November.....	24	14	13	†	3	1	11	17	13	12	†	3	1	9
December.....	4	3	—	—	—	—	3	4	3	—	—	—	—	4

* Each Sample consists of 50 fish.
† Closed Season.

TABLE 2.

DATES OF FULL MOON FOR THE PERIOD, 1950–56.

Month.	Number of Days.	Dates of Full Moon 1950–56.						
		1950.	1951.	1952.	1953.	1954.	1955.	1956.
January	31	4th.	23rd.	12th.	30th.	19th.	8th.	27th.
February	28	3rd.	21st.	11th.	28th.	17th.	7th.	26th.
March	31	4th.	23rd.	11th.	30th.	19th.	8th.	26th.
April	30	2nd.	21st.	10th.	29th.	18th.	7th.	25th.
May	31	2nd.	21st.	9th.	28th.	17th.	7th.	24th.
June	30	29th.	19th.	8th.	27th.	16th.	5th.	23rd.
July	31	29th.	18th.	7th.	26th.	16th.	5th.	22nd.
August	31	27th.	17th.	5th.	24th.	14th.	3rd.	21st.
September	30	26th.	15th.	4th.	23rd.	12th.	2nd.	20th.
October	31	25th.	15th.	3rd.	22nd.	12th.	1st. & 31st.	19th.
November	30	24th.	13th.	2nd.	21st.	10th.	29th.	18th.
December	31	24th.	13th.	1st.	20th.	10th.	29th.	17th.

TABLE 3.

NUMBER OF DAYS PER MONTH WHEN NO FISHING TOOK PLACE DUE TO BRIGHT MOON PERIOD, 1950–55.

Month.	1950.	1951.	1952.	1953.	1954.	1955.
January	—	8	8	8	8	8
February	—	8	8	8	8	8
March	10	8	8	9	8	8
April	8	8	8	8	8	8
May	9	8	8	10	8	8
June	9	8	8	8	8	8
July	8	8	8	9	8	9
August	11	8	9	8	8	9
September	8	8	9	8	8	9
October	8	8	9	8	8	9
November	8	8	9	8	8	9
December	8	8	9	8	8	9
Mean	8·7	8·0	8·4	8·3	8·0	8·5
Range	3	0	1	2	0	1

Table 4.

Standard Length of Female Pilchards taken from seven consecutive Samples.

Sample No. 369	Sample No. 370.	Sample No. 372.	Sample No. 373	Sample No. 374.	Sample No. 375	Sample No. 376.
cm.	cm.	cm.	cm.	cm.	cm.	cm.
24 1	22 2	22 1	21 4	22 3	22 4	21 1
23 1	23 1	23 6	23 3	23 3	23 2	23 1
24 2	22 4	23 1	23 4	23 6	24 1	22 2
22 1	23 1	23 1	23 1	23 6	24 3	22 4
22 1	22 3	23 6	22 1	23 3	22 1	24 1
22 2	24 3	22 1	22 3	22 1	22 5	22 5
23 4	24 1	22 5	23 5	21 4	23 5	23 5
24 4	24 1	23 2	22 3	22 2	22 5	23 1
24 3	22 4	22 1	23 1	22 1	22 5	23 2
24 1	23 3	22 1	23 1	21 2	22 3	22 1
22 5	23 1	22 4	23 1	22 1	24 2	24 4
22 3	23 1	22 3	23 0	23 1	22 1	23 1
23 5	22 1	22 2	22 1	23 4	22 2	22 5
23 1	22 2	21 4	22 1	21 2	21 1	22 2
23 1	24 2	22 2	22 7	22 5	23 4	21 1
22 7	22 5	23 0	21 3	21 1	22 2	22 2
23 2	22 1	21 4	23 2	23 2	23 1	23 1
22 5	23 1	23 2	23 3	22 2	23 1	22 1
22 6	21 3	22 3	22 2	22 2	22 5	22 2
24 3	22 2	22 5	22 5	21 2	22 2	22 1
22 0	22 5	23 0	22 4	22 4	24 4	22 2
22 4	22 3	22 3	23 4	22 1	23 3	22 1
22 1	23 1	23 1	24 7	21 2	22 2	22 1
22 2	22 3	23 1	22 7	23 0	23 3	22 1
22 3	23 1	23 6	23 0	22 4	23 4	22 1
22 2	22 1	23 0	22 1	22 3	22 1	22 1
23 2	22 1	22 7	23 3		22 1	22 2
23 6	22 1	23 6	23 1		22 1	22 1
23 6	22 1	23 0	22 2		22 1	22 1
22 3	22 1	22 1	22 2		22 1	22 3
23 3	22 1	22 1	22 1		22 1	22 2
23 3	22 1	22 1	22 1		22 1	22 1
23 6	22 1	22 0	22 1		22 1	22 1
	22 1	23 2	22 1		22 1	22 2
	22 1		22 1		22 1	22 1
	22 1		22 1		22 1	22 1
	22 1		22 1		22 1	22 1

TABLE 5.

STANDARD LENGTHS OF MALE PILCHARDS TAKEN FROM SEVEN CONSECUTIVE SAMPLES.

Sample. No. 369.	Sample No. 370.	Sample No. 372.	Sample No. 373.	Sample No. 374.	Sample No. 375.	Sample No. 376.
cm	cm	cm	cm	cm	cm	cm
21·2	22·9	22·1	22·1	22·2	22·4	22·0
22·6	23·0	22·0	21·5	22·5	22·1	22·1
21·9	23·1	23·0	22·2	22·5	21·8	22·8
22·6	19·4	22·1	22·6	23·3	21·6	22·9
22·4	21·4	22·9	21·9	22·0	22·9	23·1
21·4	23·0	21·6	22·5	22·0	23·3	23·9
22·4	22·0	22·0	22·9	22·0	21·6	21·9
21·9	22·7	21·4	23·2	21·6	23·3	21·3
21·0	21·6	21·8	21·7	22·1	21·9	22·9
22·3	21·9	21·6	22·2	22·0	21·7	22·0
21·8	21·1	22·6	22·1	22·0	21·6	22·2
21·3	25·0	22·6	22·4	21·5	23·8	22·0
23·4	22·7	22·0	21·9	24·1	22·2	21·9
21·9	22·3	21·0	22·7	21·5	22·6	22·7
20·5	22·3	22·0	22·4	22·2	21·5	22·1
22·6	22·2	22·2		22·2		22·1
	23·4	22·3		22·0		21·5
	22·0	20·7		23·2		22·4
	22·9			21·8		21·6
	21·2			21·7		21·7
	21·1			22·3		20·7
	22·2			22·6		22·0
	20·9			21·9		
	21·2					
	21·8					

Table 6.

Standard Lengths of Pilchards used to compare 1-Boat and 5-Boat Sampling.

Sample No.	First Test.				Second Test.				Third Test.				Fourth Test.				Fifth Test.			
	587		588		603		604		609		610		620		621		634		635	
Date	14/3/56.		14/3/56.		4/4/56.		4/4/56.		11/4/56.		11/4/56.		4/7/56.		4/7/56.		9/8/56.		9/8/56.	
Type of Sample	1-Boat.		5-Boat.		1-Boat.		5-Boat.		1-Boat.		5-Boat.		1-Boat.		5-Boat.		1-Boat.		5-Boat.	
Sex.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Standard Lengths in Centimetres.	22·1	23·6	22·3	23·4	22·1	23·0	22·6	24·2	20·2	23·9	21·9	22·9	22·1	23·4	21·3	23·8	21·4	23·2	22·5	23·2
	22·0	23·6	22·4	24·4	21·9	23·8	22·8	25·4	21·9	23·6	22·2	23·1	22·5	23·0	22·9	22·9	22·2	23·4	21·6	23·3
	22·2	22·7	22·4	22·2	21·3	23·8	23·1	24·0	22·4	21·7	23·0	24·1	21·7	23·5	22·9	23·7	23·0	23·3	23·0	24·3
	22·8	22·6	22·0	22·8	19·3	23·3	22·0	22·5	22·0	24·2	19·9	23·8	19·6	21·2	22·4	18·9	22·5	23·1	22·8	23·3
	23·1	23·1	22·1	22·2	19·7	19·6	23·7	23·2	19·6	22·0	22·1	22·3	21·5	22·8	22·2	23·7	21·0	24·4	23·6	22·0
	22·5	23·9	21·4	22·7	24·0	18·8	22·6	22·8	20·2	19·1	22·1	22·4	19·2	18·9	22·4	19·9	22·3	23·6	22·4	22·7
	22·7	23·9	22·3	22·7	21·8	20·3	18·4	22·3	21·7	19·9	19·8	22·8	23·1	23·3	21·8	22·0	21·3	23·6	22·3	23·3
	22·8	23·0	22·1	23·0	21·3	24·1	22·2	22·7	19·5	20·7	22·1	23·9	21·8	22·6	23·2	21·8	22·8	22·2	21·9	22·6
	23·6	22·8	22·1	23·1	23·4	22·6	23·1	22·8	19·8	19·2	19·6	23·4	19·7	22·5	22·1	18·6	21·6	22·2	22·2	22·6
	22·2	23·6	21·9	22·8	22·1	22·6	22·4	19·0	23·1	19·9	19·4	23·5	20·9	23·8	18·8	17·8	23·1	22·0	21·9	18·9
	22·7	21·8	22·0	22·0	19·4	19·8	22·1	19·2	19·0	20·0	22·8	22·2	22·0	21·8	19·4	23·3	22·6	23·5	21·9	22·5
	22·2	21·9	22·0	24·2	18·8	22·5	22·9	20·0	23·3	19·8	21·2	22·7	19·3	23·0	22·4	20·1	22·2	22·6	23·0	22·6
	22·9	23·2	22·4	19·4	19·4	20·2	22·7	23·5	18·8	19·5	22·8	23·7	19·7	23·9	23·0	22·7	20·7	22·6	22·3	23·1
	22·3	22·6	21·8	24·0	22·5	23·3	22·6	23·6	19·0	23·1	21·9	25·2	20·7	21·9	20·0	19·8	22·8	22·4	21·8	23·2
	22·8	22·2	22·6	23·3	19·7	23·0	19·5	22·8	21·7	19·8	22·8	22·5	21·1	22·2	22·1	19·0	22·6	22·1	22·3	23·0
	22·2	24·0	23·0	22·6	21·6	20·0	22·6	22·3	20·0	22·9	22·4	22·7	21·6	23·0	22·1	22·6	—	22·7	23·4	23·4
	23·0	22·8	18·3	22·5	22·3	22·7	20·0	20·4	18·6	20·2	—	25·2	21·9	22·4	22·3	18·8	—	23·4	21·1	22·6
	21·6	22·4	23·6	24·7	23·8	24·0	22·4	22·1	18·9	19·9	—	23·0	18·9	20·3	22·7	22·9	—	23·0	23·0	23·5
	23·6	23·7	22·1	22·2	19·8	22·8	21·5	24·1	20·0	22·3	—	22·6	21·8	23·5	17·6	22·1	—	20·0	22·8	22·6
	23·4	22·7	22·3	22·5	22·0	22·7	21·9	22·7	22·3	23·4	—	22·3	—	20·4	22·9	23·6	—	22·9	22·3	22·5
	22·4	23·4	22·0	23·1	22·4	23·0	20·1	23·5	20·6	20·1	—	24·2	—	20·6	18·4	23·5	—	23·8	21·4	24·1
	—	22·8	22·2	25·3	18·8	23·0	—	22·8	19·4	21·1	—	22·5	—	23·5	19·0	22·8	—	23·4	22·2	23·7
	—	23·2	22·9	23·7	—	19·5	—	23·1	21·1	19·1	—	22·4	—	22·7	22·1	21·0	—	22·5	—	23·1
	—	22·7	22·8	23·9	—	24·0	—	20·6	21·9	—	—	22·5	—	22·6	22·3	21·2	—	21·9	—	20·8
	—	21·8	—	23·9	—	23·7	—	22·4	19·4	—	—	23·1	—	23·1	—	23·0	—	23·4	—	19·8
	—	19·6	—	23·2	—	20·4	—	23·1	20·2	—	—	20·3	—	20·9	—	22·5	—	19·9	—	23·7
	—	23·1	—	—	—	24·1	—	22·3	19·3	—	—	23·6	—	23·3	—	—	—	24·4	—	22·6
	—	23·8	—	—	—	23·1	—	23·5	—	—	—	21·5	—	23·2	—	—	—	22·9	—	23·7
	—	22·6	—	—	—	—	—	22·1	—	—	—	19·1	—	24·1	—	—	—	22·4	—	—
	—	—	—	—	—	—	—	—	—	—	—	22·2	—	19·1	—	—	—	23·6	—	—
	—	—	—	—	—	—	—	—	—	—	—	23·0	—	23·0	—	—	—	24·1	—	—
	—	—	—	—	—	—	—	—	—	—	—	22·5	—	—	—	—	—	22·5	—	—
	—	—	—	—	—	—	—	—	—	—	—	21·6	—	—	—	—	—	24·2	—	—
	—	—	—	—	—	—	—	—	—	—	—	24·2	—	—	—	—	—	23·0	—	—
												—	—	—	—	—	—	22·1	—	—

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Table 7 (*a*).

Length Frequencies of Commercial Catches of Pilchards, 1950.

Length Groups.	March.			April.			May.			June.			July.			August.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm																		
15·0–15·4	—	—	—	(0) 1	— (0)	(0) 1 (0)	—	—	—	—	—	—	—	—	—	—	—	—
16·0–16·4	—	—	—	—	1 (1)	1 (1)	—	—	—	—	—	—	—	— (0)	— (0)	—	—	—
16·5–16·9	—	—	—	— (1)	4 (1)	4 (1)	—	—	—	—	— (0)	— (0)	— (1)	1	1 (0)	— (0)	—	— (0)
17·0–17·4	—	—	—	3 (0)	3 (1)	6 (1)	— (0)	— (0)	— (0)	— (0)	1 (0)	1 (0)	3 (1)	— (2)	3 (1)	1 (1)	—	1 (0)
17·5–17·9	—	—	—	1	4 (1)	5 (0)	2 (2)	3 (1)	5 (2)	1 (1)	1 (0)	2 (0)	4 (6)	7 (2)	11 (4)	4 (2)	— (1)	4 (2)
18·0–18·4	—	1 (4)	1 (2)	—	3 (1)	3 (1)	13 (3)	8 (3)	21 (3)	3 (1)	3 (1)	6 (1)	20 (5)	9 (3)	29 (4)	13 (3)	8 (2)	21 (2)
18·5–18·9	— (9)	— (7)	— (8)	3 (2)	7 (1)	10 (2)	18 (6)	24 (5)	42 (5)	8 (3)	10 (3)	18 (3)	18 (7)	13 (7)	31 (7)	15 (5)	12 (4)	27 (4)
19·0–19·4	2 (5)	2	4 (2)	6 (3)	7 (1)	13 (2)	34 (5)	38 (4)	72 (5)	19 (4)	21 (4)	40 (4)	25 (7)	33 (6)	58 (6)	29 (6)	29 (4)	58 (5)
19·5–19·9	1 (5)	—	1 (2)	12 (3)	4 (3)	16 (3)	29 (7)	34 (4)	63 (5)	22 (7)	36 (4)	58 (5)	22 (8)	28 (6)	50 (7)	33 (7)	29 (3)	62 (5)
20·0–20·4	1 (5)	— (4)	1 (4)	12 (6)	13 (2)	25 (4)	43 (7)	33 (5)	76 (6)	38 (10)	36 (6)	74 (8)	27 (7)	28 (4)	55 (5)	39 (6)	23 (4)	62 (5)
20·5–20·9	1 (5)	1 (4)	2 (4)	22 (7)	11 (4)	33 (5)	38 (7)	45 (4)	83 (5)	55 (8)	49 (5)	104 (6)	23 (8)	20 (6)	43 (7)	35 (8)	30 (4)	65 (6)
21·0–21·4	1 (9)	1	2 (4)	23 (8)	16 (3)	39 (5)	40 (11)	35 (6)	75 (8)	46 (13)	40 (6)	86 (9)	28 (9)	28 (7)	56 (8)	43 (8)	34 (4)	77 (6)
21·5–21·9	2 (9)	— (11)	2 (10)	29 (21)	13 (9)	42 (14)	61 (17)	48 (12)	109 (14)	69 (19)	49 (12)	118 (15)	30 (14)	34 (11)	64 (12)	47 (16)	35 (9)	82 (12)
22·0–22·4	2 (27)	3 (11)	5 (18)	72 (20)	41 (15)	113 (17)	98 (16)	95 (14)	193 (15)	105 (18)	93 (16)	198 (17)	48 (15)	51 (11)	99 (13)	88 (17)	73 (16)	161 (16)
22·5–22·9	6 (9)	3 (21)	9 (16)	69 (14)	69 (22)	138 (18)	95 (12)	118 (16)	213 (14)	98 (9)	131 (19)	229 (15)	51 (6)	51 (16)	102 (12)	93 (12)	126 (19)	219 (16)
23·0–23·4	2 (9)	6 (7)	8 (8)	50 (9)	98 (16)	148 (13)	72 (5)	128 (15)	200 (11)	50 (5)	149 (12)	199 (9)	21 (2)	74 (9)	95 (6)	66 (7)	151 (16)	217 (12)
23·5–23·9	2 (5)	2 (18)	4 (12)	30 (3)	71 (12)	101 (8)	28 (1)	120 (6)	148 (4)	25 (1)	100 (7)	125 (4)	8 (2)	41 (6)	49 (4)	37 (1)	126 (8)	163 (5)
24·0–24·4	1 (5)	5 (11)	6 (8)	10	53 (4)	63 (2)	7 (0)	48 (3)	55 (2)	7 (0)	53 (3)	60 (2)	8 (0)	27 (3)	35 (2)	8 (0)	62 (5)	70 (3)
24·5–24·9	1	3 (4)	4 (2)	— (1)	19 (2)	19 (2)	2	21 (2)	23 (1)	1	23 (1)	24 (0)	1	12 (1)	13 (1)	2 (0)	40 (2)	42 (1)
25·0–25·4	—	1	1	4	11 (1)	15 (1)	—	19	19	—	6 (0)	6 (0)	—	4	4	1	13 (0)	14 (0)
25·5–25·9	—	—	—	—	5	5	—	— (0)	— (0)	—	2	2	—	— (0)	— (0)	—	3	3
26·0–26·4	—	—	—	—	—	—	—	1	1	—	—	—	—	1	1	—	—	—
Total No. of Fish...	22	28	50	347	453	800	580	818	1,398	547	803	1,350	337	462	799	554	794	1,348

N.B.—Numbers in brackets (above) indicate percentage frequencies.

Table 7 (*b*).

Length Frequencies of Commercial Catches of Pilchards, 1950.

Length Groups.	September.			October.			November.			December.			Year.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm															
15·0–15·4	—	—	—	—	—	—	—	—	—	—	—	—	(0)	(0)	(0)
													1	0	1
15·5–15·9	—	—	—	—	—	—	—	—	—	—	—	—	(0)	(0)	(0)
		(0)	(0)							(1)		(1)	0	1	1
16·0–16·4	—	1	1	—	—	—	—	—	—	1	—	1	(0)	(0)	(0)
	(0)	(1)	(1)										1	6	7
16·5–16·9	1	3	4	—	—	—	—	—	—	—	—	—	(0)	(0)	(0)
	(0)		(0)				(0)		(0)				8	7	15
17·0–17·4	1	—	1	—	—	—	2	—	2	—	—	—	(0)	(0)	(0)
	(2)	(1)	(1)	(1)		(0)	(1)	(0)	(1)				15	15	30
17·5–17·9	4	3	7	1	—	1	5	1	6	—	—	—	(2)	(1)	(1)
	(1)	(1)	(1)	(1)		(0)	(2)	(0)	(1)				59	46	105
18·0–18·4	2	4	6	1	—	1	7	3	10	—	—	—	(2)	(2)	(2)
	(5)	(1)	(2)	(1)	(0)	(1)	(6)	(1)	(3)				72	73	145
18·5–18·9	13	3	16	2	1	3	24	10	34	—	—	—	(5)	(3)	(4)
	(2)	(2)	(2)	(4)	(1)	(2)	(7)	(5)	(6)	(2)	(1)	(1)	154	134	288
19·0–19·4	6	7	13	6	3	9	30	32	62	2	1	3	(5)	(4)	(4)
	(4)	(6)	(5)	(4)	(5)	(5)	(6)	(6)	(6)	(2)	(2)	(2)	163	174	337
19·5–19·9	11	26	37	6	12	18	26	38	64	2	2	4	(6)	(4)	(5)
	(7)	(5)	(6)	(11)	(8)	(9)	(6)	(6)	(6)	(12)	(4)	(8)	205	211	416
20·0–20·4	17	23	40	16	21	37	24	40	64	11	5	16	(7)	(5)	(6)
	(6)	(3)	(4)	(10)	(7)	(8)	(6)	(5)	(5)	(7)	(4)	(5)	242	245	487
20·5–20·9	16	12	28	14	17	31	25	33	58	6	4	10	(7)	(5)	(6)
	(13)	(4)	(7)	(11)	(9)	(10)	(8)	(6)	(6)	(10)	(3)	(6)	242	220	462
21·0–21·4	33	19	52	15	24	39	34	37	71	9	3	12	(10)	(5)	(7)
	(17)	(9)	(12)	(18)	(9)	(12)	(15)	(7)	(10)	(12)	(4)	(8)	329	262	591
21·5–21·9	45	39	84	25	24	49	66	44	110	11	5	16	(17)	(10)	(13)
	(18)	(13)	(15)	(23)	(11)	(15)	(20)	(13)	(16)	(20)	(13)	(16)	560	468	1,028
22·0–22·4	48	57	105	32	28	60	86	89	175	18	14	32	(18)	(14)	(16)
	(13)	(19)	(17)	(9)	(15)	(12)	(13)	(19)	(17)	(23)	(21)	(22)	596	686	1,282
22·5–22·9	35	85	120	12	37	49	54	129	183	21	23	44	(12)	(18)	(15)
	(6)	(16)	(12)	(4)	(16)	(12)	(5)	(15)	(11)	(6)	(20)	(14)	383	880	1,263
23·0–23·4	16	70	86	5	42	47	23	100	123	5	22	27	(5)	(14)	(11)
	(4)	(11)	(8)	(3)	(10)	(7)	(4)	(9)	(7)	(2)	(16)	(10)	179	694	873
23·5–23·9	10	48	58	4	25	29	18	57	75	2	18	20	(2)	(8)	(6)
	(0)	(6)	(4)		(6)	(4)	(1)	(6)	(4)	(2)	(7)	(5)	75	396	471
24·0–24·4	1	26	27	—	16	16	5	37	42	2	8	10	(0)	(4)	(3)
	(0)	(1)	(1)	(1)	(2)	(1)		(2)	(1)		(4)	(3)	15	205	220
24·5–24·9	1	6	7	1	4	5	—	16	16	—	5	5	(0)	(2)	(1)
		(1)	(1)		(0)	(0)		(0)	(0)				7	85	92
25·0–25·4	—	5	5	—	1	1	—	3	3	—	—	—	(0)	(0)	(0)
		(0)	(0)										0	19	19
25·5–25·9	—	1	1	—	—	—	—	—	—	—	—	—	(0)	(0)	(0)
													0	3	3
Total No. of Fish	260	438	698	140	255	395	429	669	1,098	90	110	200	3,306	4,830	8,136

N.B.—Numbers in brackets (above) indicate percentage frequencies.

TABLE 8 (*a*).

LENGTH FREQUENCIES OF COMMERCIAL CATCHES OF PILCHARDS, 1951.

Length Groups.	JANUARY.			FEBRUARY.			MARCH.			APRIL.			MAY.			JUNE.			JULY.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm																					
14·0–14·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(0)	(0)	
																			2	2	
14·5–14·9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(0)	(0)	
																			1	1	
15·0–15·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
15·5–15·9	—	—	—	—	(1)	(0)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
					1	1													(0)	(0)	
16·0–16·4	—	—	—	—	—	—	(1)	(1)	(1)	—	—	—	—	—	—	—	—	—	1	1	
							2	2	4										(0)	(0)	
16·5–16·9	—	—	—	—	(2)	(1)	(1)	—	(0)	(0)	—	(0)	—	—	—	—	—	—	1	2	
					3	3	2		2	1		1								(0)	
17·0–17·4	—	—	—	—	—	—	(0)	(0)	(0)	(0)	—	(0)	(1)	(0)	(0)	—	—	—	—	1	
							1	1	2	1		1	3	1	4				(0)	(0)	
17·5–17·9	—	—	—	—	—	—	—	(0)	(0)	—	—	—	—	—	—	—	(0)	(0)	2	4	
								1	1								1	1	(1)	(1)	
18·0–18·4	—	—	—	(2)	(1)	(1)	(1)	(1)	(1)	(0)	—	(0)	—	(0)	(0)	(0)		(0)	9	12	
				2	1	3	2	4	6	1		1		1	1	1		1	(1)	(1)	
18·5–18·9	—	—	—	(2)	(1)	(1)	—	(1)	(0)	—	—	—	(0)	(1)	(1)	(0)	(0)	(0)	7	10	
				2	1	3		2	2				1	5	6	1	1	2	(1)	(2)	
19·0–19·4	—	—	—	—	(1)	(0)	(1)	(1)	(1)	—	(0)	(0)	(1)	(1)	(1)	(1)	(0)	(0)	4	14	
					1	1	2	2	4		1	1	6	5	11	2	2	4	(2)	(2)	
19·5–19·9	—	—	—	(2)	(1)	(1)	(2)	—	(1)	—	(0)	(0)	(2)	(1)	(1)	(1)	(0)	(1)	12	16	
				2	1	3	4		4		1	1	7	5	12	4	1	5	(2)	(1)	
20·0–20·4	—	(6)	(4)	(5)	(1)	(2)	(1)	(1)	(1)	(1)	(1)	(1)	(4)	(2)	(3)	(4)	(1)	(2)	11	11	
		2	2	5	1	6	3	3	6	2	3	5	19	13	32	13	7	20	(4)	(3)	
20·5–20·9	—	—	—	(4)	(1)	(2)	(2)	(1)	(2)	(4)	(1)	(2)	(11)	(3)	(6)	(13)	(4)	(8)	28	25	
				4	2	6	5	4	9	13	4	17	50	18	68	48	21	69	(9)	(6)	
21·0–21·4	(7)	(6)	(6)	(9)	(5)	(7)	(2)	(4)	(3)	(9)	(5)	(7)	(19)	(10)	(14)	(18)	(11)	(14)	58	48	
	1	2	3	9	8	17	5	12	17	28	22	50	88	61	149	66	51	117	(14)	(10)	
21·5–21·9	(14)	(6)	(8)	(9)	(3)	(6)	(10)	(3)	(6)	(11)	(9)	(10)	(15)	(13)	(14)	(16)	(15)	(16)	88	83	
	2	2	4	9	5	14	22	9	31	34	40	74	69	76	145	59	73	132	(16)	(11)	
22·0–22·4	(21)	(3)	(8)	(20)	(11)	(14)	(18)	(7)	(10)	(17)	(9)	(12)	(18)	(12)	(15)	(17)	(15)	(16)	99	90	
	3	1	4	20	16	36	38	22	60	54	39	93	82	71	153	64	72	136	(15)	(10)	
22·5–22·9	(29)	(23)	(24)	(20)	(11)	(15)	(24)	(13)	(17)	(28)	(17)	(21)	(13)	(15)	(14)	(16)	(15)	(15)	92	86	
	4	8	12	21	16	37	51	42	93	87	73	160	60	90	150	58	73	131	(18)	(13)	
23·0–23·4	(29)	(20)	(22)	(21)	(17)	(19)	(21)	(22)	(22)	(19)	(21)	(20)	(8)	(17)	(13)	(9)	(15)	(12)	115	103	
	4	7	11	22	25	47	46	74	120	58	94	152	37	98	135	33	71	104	(10)	(14)	
23·5–23·9	—	(23)	(16)	(4)	(19)	(13)	(9)	(22)	(17)	(6)	(18)	(13)	(5)	(14)	(10)	(4)	(10)	(8)	63	118	
		8	8	4	29	33	19	74	93	19	80	99	25	80	105	16	49	65	(4)	(12)	
24·0–24·4	—	(3)	(2)	(1)	(14)	(9)	(6)	(17)	(13)	(4)	(10)	(7)	(2)	(7)	(5)	(1)	(8)	(5)	25	97	
		1	1	1	21	22	12	58	70	11	45	56	9	42	51	2	39	41	(2)	(8)	
24·5–24·9	—	(6)	(4)	(1)	(6)	(4)	(1)	(3)	(2)	—	(8)	(4)	(0)	(3)	(2)		(3)	(2)	10	67	
		2	2	1	9	10	2	11	13	—	33	33	2	17	19	—	13	13	(0)	(3)	
25·0–25·4	—	(3)	(2)		(5)	(3)	(0)	(2)	(2)	—	(1)	(0)	—	(1)	(1)	—	(1)	(0)	1	26	
		1	1	—	7	7	1	8	9	—	3	3		8	8	—	4	4	(0)	(1)	
25·5–25·9	—	(3)	(2)	—	(1)	(0)	—	(1)	(0)	—	(0)	(0)	—	(0)	(0)	—	(1)	(0)	2	6	
		1	1	—	1	1	—	2	2	—	2	2	—	1	1	—	3	3	—	—	—
26·0–26·4	—	—	—	—	—	—	—	(0)	(0)	—	—	—	—	—	—	—	(0)	(0)	—	—	—
								1	1								1	1			
TOTAL NO. OF FISH	14	35	49	102	148	250	217	332	549	309	440	749	458	592	1,050	367	482	849	627	823	1,450

N.B.—Numbers in brackets (above) indicate percentage frequencies.

TABLE 8 (*b*).

LENGTH FREQUENCIES OF COMMERCIAL CATCHES OF PILCHARDS, 1951.

Length Groups.	AUGUST.			SEPTEMBER.			OCTOBER.			NOVEMBER.			DECEMBER.			YEAR.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm																		
14·0–14·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 2	(0) 2
14·5–14·9	—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—	—	(0) 2	(0) 2
15·0–15·4	—	—	—	—	—	—	—	—	—	—	—	—	—	(1) 1	(1) 1	—	(0) 1	(0) 1
15·5–15·9	—	—	—	—	—	—	—	—	—	(0) 1	(1) 2	(0) 3	(3) 2	—	(1) 2	(0) 3	(0) 4	(0) 7
16·0–16·4	—	—	—	—	—	—	—	—	—	(1) 2	(1) 2	(1) 4	(4) 3	(6) 5	(5) 8	(0) 8	(0) 11	(0) 19
16·5–16·9	—	—	—	—	—	—	—	—	—	(1) 2	(1) 3	(1) 5	(3) 2	(1) 1	(2) 3	(0) 7	(0) 8	(0) 15
17·0–17·4	—	—	—	—	—	—	—	—	—	(1) 4	(2) 7	(2) 11	—	(5) 4	(3) 4	(0) 11	(0) 17	(0) 28
17·5–17·9	—	(0) 1	(0) 1	—	—	—	—	—	—	(1) 4	(2) 9	(2) 13	(4) 3	(3) 2	(3) 5	(1) 16	(1) 26	(1) 42
18·0–18·4	—	(0) 1	(0) 1	—	—	—	—	—	—	(2) 5	(2) 6	(2) 11	(1) 1	(1) 1	(1) 2	(1) 19	(1) 24	(1) 43
18·5–18·9	(1) 2	(0) 1	(0) 3	—	—	—	—	(1) 1	(0) 1	(2) 6	(1) 4	(1) 10	(3) 2	(7) 6	(5) 8	(1) 18	(1) 35	(1) 53
19·0–19·4	(0) 1	(0) 1	(0) 2	—	—	—	(1) 1	—	(0) 1	(2) 5	(1) 5	(1) 10	(9) 6	(3) 2	(5) 8	(1) 35	(1) 35	(1) 70
19·5–19·9	(1) 3	(1) 4	(1) 7	(4) 3	(1) 1	(2) 4	(2) 2	—	(1) 2	(1) 4	(1) 3	(1) 7	(1) 1	(4) 3	(3) 4	(1) 41	(1) 30	(1) 71
20·0–20·4	(3) 10	(1) 8	(2) 18	(1) 1	(2) 2	(2) 3	(1) 1	(2) 3	(2) 4	(3) 10	(2) 9	(3) 19	(6) 4	—	(3) 4	(3) 96	(2) 76	(2) 172
20·5–20·9	(8) 31	(3) 18	(5) 49	(4) 3	(1) 1	(2) 4	(12) 15	(1) 1	(7) 16	(6) 19	(4) 15	(5) 34	(6) 4	(4) 3	(5) 7	(8) 250	(3) 135	(5) 385
21·0–21·4	(18) 69	(9) 57	(13) 126	(11) 9	(6) 7	(8) 16	(19) 23	(4) 5	(11) 28	(13) 39	(6) 23	(9) 62	(11) 8	(6) 5	(9) 13	(14) 433	(8) 336	(11) 769
21·5–21·9	(15) 60	(11) 67	(13) 127	(16) 13	(14) 16	(15) 29	(18) 22	(12) 15	(15) 37	(15) 48	(11) 42	(13) 90	(6) 4	(14) 11	(10) 15	(14) 441	(11) 446	(12) 887
22·0–22·4	(18) 72	(11) 64	(14) 136	(16) 13	(16) 18	(16) 31	(15) 18	(10) 12	(12) 30	(17) 54	(11) 43	(14) 97	(11) 8	(7) 6	(10) 14	(17) 518	(11) 450	(13) 968
22·5–22·9	(16) 64	(15) 93	(16) 157	(17) 14	(9) 10	(12) 24	(17) 21	(22) 27	(20) 48	(14) 43	(12) 47	(13) 90	(11) 8	(9) 7	(10) 15	(18) 546	(14) 589	(16) 1,135
23·0–23·4	(12) 47	(16) 99	(15) 146	(18) 15	(11) 12	(14) 27	(6) 8	(17) 21	(12) 29	(11) 35	(16) 64	(14) 99	(11) 8	(5) 4	(8) 12	(12) 376	(16) 687	(15) 1,063
23·5–23·9	(6) 24	(15) 90	(11) 114	(6) 5	(18) 21	(13) 26	(7) 9	(20) 25	(14) 34	(7) 23	(10) 39	(9) 62	(6) 4	(11) 9	(9) 13	(6) 173	(14) 601	(11) 774
24·0–24·4	(2) 6	(10) 62	(7) 68	(5) 4	(13) 15	(10) 19	(2) 2	(7) 9	(4) 11	(2) 5	(10) 40	(6) 45	—	(9) 7	(5) 7	(2) 62	(10) 406	(6) 468
24·5–24·9	(0) 1	(5) 29	(3) 30	(1) 1	(6) 7	(4) 8	—	(2) 3	(1) 3	(1) 3	(4) 16	(3) 19	(3) 2	(4) 3	(3) 5	(0) 13	(4) 169	(3) 182
25·0–25·4	(0) 1	(1) 9	(1) 10	(1) 1	(3) 3	(2) 4	—	(2) 2	(1) 2	—	(2) 7	(1) 7	—	—	—	(0) 5	(1) 58	(1) 63
25·5–25·9	—	(1) 4	(0) 4	—	—	—	—	—	—	—	(0) — 1	(0) 1	—	—	—	—	(0) 15	(0) 15
26·0–26·4	—	(0) 1	(0) 1	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 3	(0) 3
TOTAL NO. OF FISH	391	609	1,000	82	113	195	122	124	246	312	388	700	70	80	150	3,071	4,166	7,237

N.B.—Numbers in brackets (above) indicate percentage frequencies.

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Table 9 (*a*).

Length Frequencies of Commercial Catches of Pilchards, 1952.

Length Groups.	January.			February.			March.			April.			May.			June.			July.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm																					
10·5–10·9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—
11·0–11·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
11·5–11·9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12·0–12·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(1) 3	(0) 3	—	—	—
12·5–12·9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 1	(1) 3	(0) 4	—	—	—
13·0–13·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(2) 10	(1) 6	(2) 16	—	—	—
13·5–13·9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(1) 6	(1) 5	(1) 11	—	—	—
14·0–14·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(1) 4	(1) 5	(1) 9	—	—	—
14·5–14·9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 1	(1) 3	(0) 4	—	—	—
15·0–15·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
15·5–15·9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—
16·0–16·4	—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—	(0) 1	—	(0) 1	—	—	—
16·5–16·9	—	—	—	—	—	—	(0) 2	(0) 1	(0) 3	(0) 1	(0) 1	(0) 2	—	—	—	—	—	—	—	—	—
17·0–17·4	—	(5) 5	(3) 5	(1) 3	(0) 1	(1) 4	—	(0) 1	(0) 1	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—
17·5–17·9	(7) 4	(3) 3	(5) 7	(4) 14	(1) 5	(2) 19	(2) 10	(1) 7	(2) 17	—	(0) 3	(0) 3	(0) 1	—	(0) 1	—	—	—	—	(0) 2	(0) 2
18·0–18·4	(12) 7	(4) 4	(7) 11	(7) 28	(3) 11	(5) 39	(5) 21	(2) 11	(3) 32	(3) 13	(1) 4	(1) 17	(1) 3	—	(0) 1	(0) 2	(0) 2	(0) 4	(1) 6	(0) 1	(1) 7
18·5–18·9	(9) 5	(10) 9	(9) 14	(8) 31	(8) 35	(8) 66	(7) 34	(6) 31	(7) 65	(2) 11	(2) 15	(2) 26	(1) 7	(1) 5	(1) 12	(2) 10	(1) 7	(2) 17	(3) 19	(3) 20	(3) 39
19·0–19·4	(11) 6	(3) 3	(6) 9	(10) 37	(6) 27	(8) 64	(12) 54	(8) 45	(10) 99	(4) 20	(2) 14	(3) 34	(6) 27	(3) 18	(5) 45	(6) 25	(4) 23	(5) 48	(8) 47	(3) 25	(5) 72
19·5–19·9	(12) 7	(5) 5	(8) 12	(7) 25	(6) 27	(7) 52	(10) 46	(8) 45	(9) 91	(9) 43	(4) 28	(6) 71	(10) 45	(6) 33	(8) 78	(10) 44	(6) 34	(8) 78	(8) 49	(6) 45	(7) 94
20·0–20·4	(9) 5	(12) 11	(11) 16	(5) 18	(7) 28	(6) 46	(7) 34	(10) 53	(9) 87	(9) 44	(8) 51	(8) 95	(9) 41	(9) 45	(8) 86	(11) 49	(7) 42	(9) 91	(9) 55	(7) 54	(8) 109
20·5–20·9	(7) 4	(9) 8	(8) 12	(6) 24	(4) 17	(5) 41	(7) 33	(7) 36	(7) 69	(7) 36	(7) 47	(7) 83	(8) 39	(6) 35	(7) 74	(9) 40	(7) 38	(8) 78	(8) 50	(7) 51	(7) 101
21·0–21·4	(7) 4	(3) 3	(5) 7	(10) 37	(4) 18	(7) 55	(10) 45	(5) 25	(7) 70	(14) 65	(9) 62	(11) 127	(14) 67	(8) 40	(11) 107	(9) 40	(6) 33	(7) 73	(10) 57	(6) 42	(7) 99
21·5–21·9	—	(10) 9	(6) 9	(10) 37	(5) 22	(7) 59	(12) 56	(6) 32	(9) 88	(18) 86	(12) 78	(14) 164	(16) 76	(12) 62	(14) 138	(13) 54	(10) 58	(11) 112	(13) 75	(8) 64	(10) 139
22·0–22·4	(14) 8	(10) 9	(11) 17	(10) 38	(7) 30	(9) 68	(13) 58	(11) 61	(12) 119	(14) 69	(16) 105	(15) 174	(19) 88	(15) 80	(17) 168	(15) 65	(16) 94	(16) 159	(16) 96	(16) 117	(16) 213
22·5–22·9	(7) 4	(8) 7	(7) 11	(10) 37	(11) 47	(11) 84	(8) 37	(14) 72	(11) 109	(11) 52	(14) 91	(13) 143	(9) 43	(17) 87	(13) 130	(9) 37	(13) 76	(11) 113	(15) 89	(16) 118	(15) 207
23·0–23·4	(5) 3	(7) 6	(6) 9	(7) 26	(15) 66	(12) 92	(4) 17	(10) 54	(7) 71	(6) 29	(12) 78	(9) 107	(5) 22	(10) 54	(8) 76	(6) 25	(10) 59	(8) 84	(7) 40	(12) 88	(9) 128
23·5–23·9	—	(5) 5	(3) 5	(3) 13	(11) 45	(7) 58	(3) 14	(6) 34	(5) 48	(1) 7	(8) 51	(5) 58	(2) 8	(6) 34	(4) 42	(2) 9	(7) 39	(5) 48	(2) 12	(9) 65	(6) 77
24·0–24·4	—	(3) 3	(2) 3	(1) 5	(7) 30	(4) 35	(0) 1	(4) 20	(2) 21	(1) 4	(3) 23	(2) 27	(0) 2	(5) 24	(3) 26	(1) 5	(4) 21	(3) 26	(1) 5	(5) 36	(3) 41
24·5–24·9	—	(1) 1	(1) 1	(0) 1	(3) 11	(2) 12	(0) 1	(1) 3	(0) 4	(0) 1	(1) 5	(1) 6	(0) 2	(2) 9	(1) 10	—	(2) 14	(1) 14	—	(2) 12	(1) 12
25·0–25·4	—	(1) 1	(1) 1	—	(1) 5	(1) 5	—	(0) 1	(0) 1	—	(1) 5	(0) 5	—	(0) 1	(0) 1	—	(1) 3	(0) 3	—	(1) 8	(1) 8
25·5–25·9	—	—	—	—	(0) 1	(0) 1	—	—	—	—	(0) 1	(0) 1	—	—	—	—	(0) 1	(0) 1	—	(0) 2	(0) 2
Total No. of Fish	57	92	149	374	426	800	463	532	995	481	663	1,144	470	527	997	428	572	1,000	600	750	1,350

N.B.—Numbers in brackets (above) indicate percentage frequencies.

Table 9 (*b*).

Length Frequencies of Commercial Catches of Pilchards, 1952.

Length Groups.	August.			September.			October.			November.			December.			Year.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm																		
10·5–10·9	—	—	—				—	—	—	—	—	—				—	(0) 1	(0) 1
11·0–11·4	—	—	—				—	—	—	—	—	—				—	—	—
11·5–11·9	—	—	—				—	—	—	—	—	—				—	—	—
12·0–12·4	—	—	—				—	—	—	—	—	—				—	(0) 3	(0) 3
12·5–12·9	—	—	—				—	—	—	—	—	—				(0) 1	(0) 3	(0) 4
13·0–13·4	—	—	—				—	—	—	—	—	—				(0) 10	(0) 6	(0) 16
13·5–13·9	—	—	—				—	—	—	—	—	—				(0) 6	(0) 5	(0) 11
14·0–14·4	—	—	—				—	—	—	—	—	—				(0) 4	(0) 5	(0) 9
14·5–14·9	—	—	—				—	—	—	—	—	—				(0) 1	(0) 3	(0) 4
15·0–15·4	—	—	—				—	—	—	—	—	—				—	—	—
15·5–15·9	—	(0) 1	(0) 1				—	—	—	—	—	—				—	(0) 2	(0) 2
16·0–16·4	—	—	—				—	—	—	(0) 1	—	(0) 1				(0) 2	(0) 1	(0) 3
16·5–16·9	—	—	—				—	—	—	(1) 2	(1) 5	(1) 7				(0) 5	(0) 7	(0) 12
17·0–17·4	—	—	—				—	—	—	(1) 3	(1) 4	(1) 7				(0) 6	(0) 12	(0) 18
17·5–17·9	—	—	—				—	—	—	(3) 9	(2) 7	(2) 16				(1) 38	(1) 27	(1) 65
18·0–18·4	(1) 2	—	(0) 2				—	—	—	(3) 10	(2) 8	(3) 18				(3) 92	(1) 41	(2) 133
18·5–18·9	(1) 4	(1) 4	(1) 8				—	—	—	(4) 11	(4) 13	(4) 24				(4) 132	(3) 139	(3) 271
19·0–19·4	(4) 13	(1) 6	(2) 19				(17) 4	—	(8) 4	(7) 20	(6) 19	(6) 39				(7) 253	(4) 180	(5) 433
19·5–19·9	(4) 16	(4) 19	(4) 35				(26) 6	(7) 2	(16) 8	(10) 30	(5) 18	(7) 48				(9) 311	(6) 256	(7) 567
20·0–20·4	(7) 25	(4) 19	(5) 44				(13) 3	(11) 3	(12) 6	(10) 30	(6) 22	(8) 52				(9) 304	(7) 328	(8) 632
20·5–20·9	(7) 27	(4) 18	(5) 45				(4) 1	(11) 3	(8) 4	(7) 22	(9) 29	(8) 51				(8) 276	(6) 282	(7) 558
21·0–21·4	(10) 35	(4) 21	(7) 56				(17) 4	(7) 2	(12) 6	(11) 34	(9) 31	(10) 65				(11) 388	(6) 277	(8) 665
21·5–21·9	(17) 60	(8) 40	(12) 100				(13) 3	(22) 6	(18) 9	(10) 31	(9) 29	(9) 60				(13) 478	(9) 400	(11) 878
22·0–22·4	(20) 73	(16) 78	(18) 151				(4) 1	(4) 1	(4) 2	(14) 44	(12) 41	(13) 85				(15) 540	(14) 616	(14) 1,156
22·5–22·9	(15) 53	(18) 86	(16) 139				—	(19) 5	(10) 5	(9) 27	(9) 30	(9) 57				(11) 379	(14) 619	(13) 998
23·0–23·4	(9) 32	(17) 81	(13) 113				—	(7) 2	(4) 2	(6) 18	(9) 32	(8) 50				(6) 212	(12) 520	(9) 732
23·5–23·9	(3) 12	(13) 65	(9) 77				(4) 1	(4) 1	(4) 2	(3) 10	(9) 31	(6) 41				(2) 86	(8) 370	(6) 456
24·0–24·4	(2) 7	(8) 37	(5) 44				—	(7) 2	(4) 2	(0) 1	(4) 14	(2) 15				(1) 30	(5) 210	(3) 240
24·5–24·9	(1) 2	(2) 11	(2) 13				—	—	—	(0) 1	(2) 7	(1) 8				(0) 7	(2) 73	(1) 80
25·0–25·4	—	(1) 3	(0) 3				—	—	—	—	(1) 5	(1) 5				—	(1) 32	(0) 32
25·5–25·9	—	—	—				—	—	—	—	—	—				—	(0) 5	(0) 5
Total No. of Fish	361	489	850				23	27	50	304	345	649				3,561	4,423	7,984

CLOSED SEASON.

NO SAMPLES TAKEN.

N.B.—Numbers in brackets (above) indicate percentage frequencies.

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TABLE 10 (*a*).

LENGTH FREQUENCIES OF COMMERCIAL CATCHES OF PILCHARDS, 1953.

Length Groups.	JANUARY.			FEBRUARY.			MARCH.			APRIL.			MAY.			JUNE.			JULY.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T
cm																					
13·5–13·9	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—	—	—	—
14·0–14·4	—	—	—	—	—	—	—	—	—	—	—	—	(1) 2	(0) 1	(0) 3	—	(0) 1	(0) 1	—	—	—
14·5–14·9	—	—	—	—	—	—	—	—	—	—	—	—	(3) 7	(2) 7	(2) 14	—	—	—	—	—	—
15·0–15·4	—	—	—	—	—	—	—	—	—	—	—	—	(4) 11	(4) 12	(4) 23	(0) 1	—	(0) 1	—	—	—
15·5–15·9	—	—	—	—	—	—	—	—	—	(1) 1	—	(0) 1	(1) 4	(1) 2	(1) 6	—	(0) 1	(0) 1	—	—	—
16·0–16·4	—	—	—	—	—	—	—	—	—	(2) 2	(1) 1	(1) 3	(0) 1	(1) 2	(0) 3	(1) 2	(1) 4	(1) 6	(1) 1	—	(0) 1
16·5–16·9	(9) 4	(2) 1	(5) 5	—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	—	(0) 1	(0) 1	—	—	—
17·0–17·4	(2) 1	(12) 7	(8) 8	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	(1) 1	—	(0) 1
17·5–17·9	(9) 4	(7) 4	(8) 8	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—
18·0–18·4	(7) 3	(12) 7	(10) 10	—	—	—	—	—	—	—	—	—	—	—	—	(0) 1	(1) 4	(1) 5	—	—	—
18·5–18·9	(11) 5	(14) 8	(13) 13	(0) 1	(0) 1	(0) 2	—	—	—	(1) 1	—	(0) 1	(0) 1	(0) 1	(0) 2	(0) 1	(0) 1	(0) 2	—	—	—
19·0–19·4	(5) 2	(4) 2	(4) 4	(2) 5	(1) 4	(2) 9	(0) 1	(0) 1	(0) 2	—	—	—	(0) 1	—	(0) 1	(2) 4	(0) 1	(1) 5	—	—	—
19·5–19·9	(7) 3	(7) 4	(7) 7	(2) 6	(2) 6	(2) 12	(1) 3	(1) 2	(1) 5	(4) 4	—	(2) 4	(0) 1	(1) 3	(1) 4	(1) 2	(1) 2	(1) 4	—	(1) 2	(0) 2
20·0–20·4	(2) 1	(2) 1	(2) 2	(9) 24	(3) 12	(6) 36	(7) 17	(2) 7	(4) 24	(1) 1	(2) 3	(2) 4	(3) 9	(1) 4	(2) 13	(7) 18	(2) 8	(4) 26	(2) 4	(0) 1	(1) 5
20·5–20·9	(7) 3	(4) 2	(5) 5	(13) 32	(6) 20	(9) 52	(8) 21	(3) 10	(5) 31	(7) 7	(5) 8	(6) 15	(12) 33	(3) 10	(7) 43	(12) 32	(5) 16	(8) 48	(8) 13	(1) 2	(3) 15
21·0–21·4	(16) 7	(5) 3	(10) 10	(20) 51	(10) 35	(14) 86	(19) 50	(14) 46	(16) 96	(27) 27	(8) 12	(16) 39	(15) 42	(9) 28	(12) 70	(17) 46	(7) 25	(12) 71	(17) 30	(3) 11	(8) 41
21·5–21·9	(7) 3	(5) 3	(6) 6	(20) 50	(17) 60	(18) 110	(23) 60	(16) 55	(19) 115	(26) 26	(18) 27	(21) 53	(19) 53	(17) 54	(18) 107	(23) 60	(13) 45	(18) 105	(22) 38	(14) 45	(17) 83
22·0–22·4	(9) 4	(14) 8	(12) 12	(16) 40	(20) 68	(18) 108	(15) 40	(21) 70	(18) 110	(13) 13	(15) 22	(14) 35	(18) 49	(16) 53	(17) 102	(18) 49	(19) 63	(19) 112	(26) 45	(20) 67	(22) 112
22·5–22·9	(2) 1	(9) 5	(6) 6	(8) 20	(14) 49	(11) 69	(14) 36	(18) 59	(16) 95	(11) 11	(19) 29	(16) 40	(13) 35	(14) 46	(14) 81	(7) 18	(19) 63	(14) 81	(12) 21	(19) 63	(17) 84
23·0–23·4	(7) 3	(4) 2	(5) 5	(4) 11	(8) 29	(7) 40	(10) 27	(14) 47	(12) 74	(7) 7	(11) 16	(9) 23	(7) 18	(13) 42	(10) 60	(9) 24	(14) 47	(12) 71	(7) 12	(19) 63	(15) 75
23·5–23·9	—	—	—	(4) 11	(9) 31	(7) 42	(3) 7	(7) 24	(5) 31	(1) 1	(11) 16	(7) 17	(3) 8	(8) 27	(6) 35	(2) 6	(7) 24	(5) 30	(2) 4	(13) 41	(9) 45
24·0–24·4	—	—	—	(0) 1	(6) 20	(3) 21	(0) 1	(4) 13	(2) 14	—	(5) 8	(3) 8	(0) 1	(6) 20	(4) 21	(0) 1	(5) 18	(3) 19	(1) 2	(7) 23	(5) 25
24·5–24·9	—	—	—	(0) 1	(2) 8	(2) 9	—	(0) 1	(0) 1	—	(2) 3	(1) 3	—	(3) 9	(2) 9	—	(2) 6	(1) 6	(1) 1	(2) 8	(2) 9
25·0–25·4	—	—	—	(0) 1	(1) 3	(1) 4	—	(0) 1	(0) 1	—	(3) 4	(2) 4	—	—	—	—	(1) 3	(0) 3	—	—	—
25·5–25·9	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—	—	(0) 1	(0) 1	—	—	—	—	(1) 2	(0) 2
TOTAL NO. OF FISH	44	57	101	254	346	600	263	337	600	101	149	250	276	324	600	265	335	600	172	328	500

N.B.—Numbers in brackets (above) indicate percentate frequencies.

TABLE 10 (*b*).

LENGTH FREQUENCIES OF COMMERCIAL CATCHES OF PILCHARDS, 1953.

Length Groups.	AUGUST.			SEPTEMBER.			OCTOBER.			NOVEMBER			DECEMBER.			YEAR.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm																		
12·5–12·9	—	—	—	—	—	—	—	—	—	(9) 2	(8) 1	(8) 3				(0) 2	(0) 1	(0) 3
13·0–13·4	—	—	—	—	—	—	—	—	—	(14) 3	(23) 3	(17) 6	—	—	—	(0) 3	(0) 3	(0) 6
13·5–13·9	—	—	—	—	—	—	—	—	—	(18) 4	(8) 1	(14) 5	—	—	—	(0) 4	(0) 2	(0) 6
14·0–14·4	—	—	—	—	—	—	—	—	—	(23) 5	(23) 3	(23) 8	(1) 1	—	(0) 1	(0) 8	(0) 5	(0) 13
14·5–14·9	—	—	—	—	—	—	—	—	—	(9) 2	(15) 2	(11) 4	(2) 2	(4) 5	(3) 7	(1) 11	(1) 14	(1) 25
15·0–15·4	—	—	—	—	—	—	—	—	—	(5) 1	(8) 1	(6) 2	(7) 9	(5) 7	(6) 16	(1) 22	(1) 20	(1) 42
15·5–15·9	—	—	—	—	—	—	—	—	—	(5) 1	—	(3) 1	(11) 13	(11) 14	(11) 27	(1) 19	(1) 17	(1) 36
16·0–16·4	—	—	—	—	—	—	—	—	—	(5) 1	—	(3) 1	(5) 6	(10) 13	(8) 19	(1) 13	(1) 20	(1) 33
16·5–16·9	—	—	—	—	—	—	—	—	—	—	—	—	(9) 11	(3) 4	(6) 15	(1) 15	(0) 7	(0) 22
17·0–17·4	—	—	—	—	—	—	—	—	—	—	—	—	(7) 9	(5) 7	(6) 16	(1) 11	(1) 15	(1) 26
17·5–17·9	—	—	—	—	(0) 1	(0) 1	—	—	—	—	—	—	(7) 8	(4) 5	(5) 13	(1) 12	(0) 11	(0) 23
18·0–18·4	—	—	—	(1) 1	(1) 2	(1) 3	—	—	—	—	—	—	(11) 14	(9) 11	(10) 25	(1) 19	(1) 24	(1) 43
18·5–18·9	—	—	—	—	(1) 3	(1) 3	—	—	—	—	—	—	(5) 6	(8) 10	(6) 16	(1) 15	(1) 24	(1) 39
19·0–19·4	(1) 1	—	(0) 1	—	(1) 3	(1) 3	—	—	—	—	—	—	(4) 5	(13) 16	(8) 21	(1) 19	(1) 27	(1) 46
19·5–19·9	—	—	—	(1) 1	(1) 3	(1) 4	—	—	—	—	—	—	(2) 2	(1) 1	(1) 3	(1) 22	(1) 23	(1) 45
20·0–20·4	—	—	—	(4) 9	(1) 2	(2) 11	—	—	—	—	—	—	(2) 3	(3) 4	(3) 7	(4) 86	(2) 42	(3) 128
20·5–20·9	(6) 11	(2) 4	(3) 15	(14) 29	(4) 9	(8) 38	(11) 4	—	(5) 4	—	—	—	(2) 3	(1) 2	(2) 5	(10) 188	(3) 83	(6) 271
21·0–21·4	(20) 39	(5) 13	(12) 52	(28) 56	(9) 22	(17) 78	(11) 4	(7) 3	(9) 7	—	—	—	(11) 14	(4) 5	(8) 19	(19) 366	(8) 203	(13) 569
21·5–21·9	(20) 38	(11) 29	(15) 67	(17) 34	(14) 35	(15) 69	(11) 4	(13) 6	(12) 10	(5) 1	(8) 1	(6) 2	(5) 6	(8) 10	(6) 16	(19) 373	(14) 370	(16) 743
22·0–22·4	(16) 32	(21) 53	(19) 85	(17) 34	(20) 51	(19) 85	(20) 7	(15) 7	(17) 14	(5) 1	—	(3) 1	(7) 9	(6) 8	(7) 17	(17) 323	(18) 470	(18) 793
22·5–22·9	(17) 34	(20) 52	(19) 86	(10) 21	(17) 43	(14) 64	(20) 7	(15) 7	(17) 14	(5) 1	(8) 1	(6) 2	(1) 1	(4) 5	(2) 6	(11) 206	(16) 422	(14) 628
23·0–23·4	(12) 24	(18) 47	(16) 71	(6) 12	(13) 33	(10) 45	(17) 6	(17) 8	(17) 14	—	—	—	—	—	—	(7) 144	(13) 334	(11) 478
23·5–23·9	(4) 8	(12) 31	(9) 39	(1) 2	(10) 25	(6) 27	(3) 1	(15) 7	(10) 8	—	—	—	—	(1) 1	(0) 1	(2) 48	(9) 227	(6) 275
24·0–24·4	(3) 5	(8) 20	(6) 25	(1) 1	(5) 13	(3) 14	(6) 2	(13) 6	(10) 8	—	—	—	—	—	—	(1) 14	(5) 141	(3) 155
24·5–24·9	(1) 2	(2) 5	(2) 7	—	(1) 3	(1) 3	—	(4) 2	(2) 2	—	—	—	—	—	—	(0) 4	(2) 45	(1) 49
25·0–25·4	—	(0) 1	(0) 1	—	(1) 2	(0) 2	—	—	—	—	—	—	—	—	—	(0) 1	(1) 14	(0) 15
25·5–25·9	—	(0) 1	(0) 1	—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 5	(0) 5
26·0–26·4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
TOTAL NO. OF FISH	194	256	450	200	250	450	35	46	81	22	13	35	122	128	250	1,948	2,569	4,517

N.B.—Numbers in brackets (above) indicate percentage frequencies.

Reprint from "Commerce & Industry", May, 1957

Table 11 (*a*).

Length Frequencies of Commercial Catches of Pilchards, 1954.

Length Groups.	January.			February.			March.			April.			May.			June.			July.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm																					
	(1)		(0)																		
18·0–18·4	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	(1)		(0)							(1)		(0)									
18·5–18·9	1	—	1	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—
	(2)		(1)					(1)	(0)	(1)		(0)							(1)	(0)	(0)
19·0–19·4	2	—	2	—	—	—	—	1	1	2	—	2	—	—	—	—	—	—	2	1	3
	(3)		(1)	(6)	(2)	(4)	(3)	(1)	(2)	(1)	(1)	(1)							(1)	(1)	(1)
19·5–19·9	4	—	4	5	2	7	4	2	6	3	3	6	—	—	—	—	—	—	3	2	5
	(3)		(1)	(6)	(4)	(5)	(3)	(3)	(3)	(3)	(3)	(3)	(0)	(0)	(0)	(1)	(1)	(1)	(5)	(3)	(3)
20·0–20·4	4	—	4	5	5	10	5	5	10	7	7	14	1	2	3	2	2	4	12	12	24
	(4)	(4)	(4)	(1)	(3)	(2)	(9)	(8)	(8)	(4)	(1)	(2)	(4)	(2)	(3)	(3)	(3)	(3)	(6)	(4)	(5)
20·5–20·9	5	8	13	1	3	4	12	13	25	9	3	12	13	12	25	6	10	16	15	17	32
	(16)	(6)	(10)	(14)	(7)	(10)	(11)	(9)	(10)	(12)	(4)	(8)	(15)	(4)	(8)	(11)	(5)	(7)	(12)	(5)	(8)
21·0–21·4	19	11	30	12	8	20	15	15	30	27	11	38	50	20	70	24	15	39	30	23	53
	(25)	(10)	(16)	(25)	(7)	(15)	(24)	(11)	(17)	(24)	(5)	(14)	(20)	(9)	(13)	(26)	(11)	(17)	(24)	(7)	(13)
21·5–21·9	29	18	47	21	8	29	33	18	51	53	15	68	68	46	114	57	36	93	59	31	90
	(21)	(21)	(21)	(28)	(26)	(27)	(31)	(19)	(24)	(28)	(23)	(25)	(33)	(18)	(24)	(28)	(20)	(23)	(28)	(20)	(23)
22·0–22·4	24	39	63	24	29	53	43	30	73	61	65	126	112	90	202	61	67	128	69	89	158
	(13)	(23)	(19)	(14)	(21)	(18)	(12)	(21)	(17)	(16)	(24)	(21)	(16)	(28)	(23)	(18)	(25)	(22)	(14)	(22)	(19)
22·5–22·9	15	42	57	12	24	36	17	34	51	35	68	103	55	144	199	40	84	124	34	100	134
	(8)	(26)	(19)	(6)	(17)	(12)	(5)	(16)	(11)	(8)	(20)	(14)	(9)	(20)	(15)	(9)	(18)	(15)	(6)	(22)	(17)
23·0–23·4	9	48	57	5	19	24	7	25	32	17	55	72	29	101	130	20	60	80	16	101	117
	(1)	(5)	(4)		(11)	(6)	(2)	(7)	(5)	(1)	(13)	(8)	(2)	(11)	(8)	(4)	(12)	(9)	(3)	(10)	(7)
23·5–23·9	1	10	11	—	12	12	3	11	14	3	36	39	7	57	64	8	39	47	7	44	51
	(2)	(3)	(2)		(1)	(0)		(3)	(2)	(1)	(4)	(2)	(0)	(6)	(4)	(0)	(4)	(3)		(4)	(3)
24·0–24·4	2	5	7	—	1	1	—	5	5	1	11	12	1	29	30	1	13	14	—	20	20
		(2)	(1)					(1)	(1)		(1)	(1)	(0)	(1)	(1)					(2)	(2)
24·5–24·9	—	3	3	—	—	—	—	2	2	—	4	4	1	7	8	—	—	—	—	11	11
										(1)	(1)	(1)		(1)	(0)		(1)	(1)		(1)	(0)
25·0–25·4	—	—	—	—	—	—	—	—	—	1	2	3	—	3	3	—	4	4	—	2	2
														(0)	(0)		(0)	(0)			
25·5–25·9	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1	—	1	1	—	—	—
					(1)	(0)															
26·0–26·4	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total No. of Fish	116	184	300	85	112	197	139	161	300	220	280	500	337	512	849	219	331	550	247	453	700

N.B.—Numbers in brackets (above) indicate percentage frequencies.

Table 11 (*b*).

Length Frequencies of Commercial Catches of Pilchards, 1954.

Length Groups.	August.			September.			October.			November.			December.			Year.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm		(1)	(1)													(0)	(0)	(0)
18·0–18·4.....	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	1	1	2
							(1)	(0)	(1)							(0)	(0)	(0)
18·5–18·9.....	—	—	—	—	—	—	2	1	3	—	—	—	—	—	—	4	1	5
							(1)	(0)	(1)					(1)	(1)	(1)	(0)	(0)
19·0–19·4.....	—	—	—	—	—	—	3	1	4	—	—	—	—	1	1	9	4	13
	(3)		(1)		(2)	(1)	(2)	(0)	(1)				(3)	(2)	(2)	(1)	(0)	(1)
19·5–19·9.....	2	—	2	—	1	1	4	1	5	—	—	—	1	2	3	26	13	39
	(2)	(2)	(2)	(11)	(2)	(6)	(4)	(2)	(2)	(4)		(1)	(22)	(12)	(15)	(3)	(2)	(3)
20·0–20·4.....	1	2	3	5	1	6	7	4	11	2	—	2	8	14	22	59	54	113
	(5)	(2)	(3)	(2)	(6)	(4)	(8)	(4)	(5)	(20)	(5)	(11)	(33)	(15)	(19)	(6)	(4)	(5)
20·5–20·9.....	3	2	5	1	3	4	15	9	24	11	5	16	12	17	29	103	102	205
	(23)	(12)	(16)	(19)	(11)	(15)	(11)	(5)	(8)	(20)	(11)	(14)	(11)	(21)	(19)	(14)	(6)	(9)
21·0–21·4.....	14	10	24	9	6	15	22	14	36	11	10	21	4	24	28	237	167	404
	(26)	(16)	(20)	(17)	(13)	(15)	(23)	(11)	(16)	(22)	(19)	(20)	(11)	(23)	(20)	(23)	(10)	(15)
21·5–21·9.....	16	14	30	8	7	15	44	28	72	12	18	30	4	26	30	404	265	669
	(25)	(22)	(23)	(28)	(30)	(29)	(28)	(18)	(22)	(17)	(19)	(18)	(14)	(12)	(13)	(28)	(20)	(23)
22·0–22·4.....	15	19	34	13	16	29	55	46	101	9	18	27	5	14	19	491	522	1,013
	(11)	(27)	(20)	(17)	(15)	(16)	(17)	(25)	(21)	(7)	(18)	(14)	(6)	(11)	(9)	(15)	(23)	(20)
22·5–22·9.....	7	23	30	8	8	16	32	64	96	4	17	21	2	12	14	261	620	881
	(2)	(16)	(10)	(2)	(17)	(10)	(3)	(17)	(11)	(9)	(18)	(15)		(3)	(2)	(7)	(19)	(14)
23·0–23·4.....	1	14	15	1	9	10	5	44	49	5	17	22	—	3	3	115	496	611
	(3)	(2)	(3)	(4)	(2)	(3)	(1)	(12)	(8)		(8)	(5)		(1)	(1)	(2)	(10)	(7)
23·5–23·9.....	2	2	4	2	1	3	3	31	34	—	8	8	—	1	1	36	252	288
							(1)	(2)	(2)		(2)	(1)				(0)	(3)	(2)
24·0–24·4.....	—	—	—	—	—	—	1	6	7	—	2	2	—	—	—	6	92	98
					(2)	(1)		(2)	(1)							(0)	(1)	(1)
24·5–24·9.....	—	—	—	—	1	1	—	6	6	—	—	—	—	—	—	1	34	35
								(1)	(0)							(0)	(0)	(0)
25·0–25·4.....	—	—	—	—	—	—	—	2	2	—	—	—	—	—	—	1	13	14
																	(0)	(0)
25·5–25·9.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
																	(0)	(0)
26·0–26·4.....	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
Total No. of Fish....	61	87	148	47	53	100	193	257	450	54	95	149	36	114	150	1,754	2,639	4,393

N.B.—Numbers in brackets (above) indicate percentage frequencies.

Reprint from "Commerce & Industry", May, 1957

Table 12 (*a*).

Length Frequencies of Commercial Catches of Pilchards, 1955.

Length Groups.	January.	February.			March.			April.			May.			June.			July.		
		M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.
cm																			
18·0–18·4		—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—
18·5–18·9		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
19·0–19·4		—	—	—	—	—	—	—	—	—	—	—	—	—	(0) 2	(0) 2	—	—	—
19·5–19·9		(0) 1	—	(0) 1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20·0–20·4		(2) 4	(1) 1	(1) 5	(0) 3	—	(0) 3	(1) 1	—	(0) 1	(0) 1	(0) 1	(0) 2	(0) 1	(0) 2	(0) 3	—	—	—
20·5–20·9		(7) 16	(1) 3	(4) 19	(3) 19	(0) 3	(1) 22	(3) 4	—	(2) 4	(4) 8	(0) 1	(2) 9	(3) 11	(0) 2	(1) 13	(4) 11	(1) 3	(2) 14
21·0–21·4		(17) 37	(4) 10	(10) 47	(19) 113	(3) 25	(9) 138	(15) 19	(6) 8	(11) 27	(21) 45	(5) 13	(12) 58	(15) 56	(5) 24	(9) 80	(20) 53	(5) 14	(12) 67
21·5–21·9		(25) 55	(11) 25	(18) 80	(28) 168	(12) 120	(18) 288	(32) 40	(12) 15	(22) 55	(32) 69	(13) 36	(21) 105	(29) 110	(15) 76	(21) 186	(27) 73	(12) 35	(20) 108
22·0–22·4		(22) 49	(19) 43	(20) 92	(25) 154	(26) 260	(26) 414	(25) 32	(23) 28	(24) 60	(20) 43	(32) 90	(27) 133	(28) 108	(26) 137	(27) 245	(26) 70	(22) 62	(24) 132
22·5–22·9		(18) 39	(18) 41	(18) 80	(15) 90	(23) 231	(20) 321	(16) 20	(18) 23	(17) 43	(17) 37	(21) 60	(19) 97	(16) 61	(23) 121	(20) 182	(13) 34	(21) 59	(17) 93
23·0–23·4		(6) 14	(24) 56	(16) 70	(7) 44	(21) 204	(16) 248	(7) 9	(26) 32	(16) 41	(5) 12	(17) 48	(12) 60	(7) 26	(17) 91	(13) 117	(9) 23	(21) 59	(15) 82
23·5–23·9		(3) 6	(15) 34	(9) 40	(3) 17	(10) 95	(7) 112	(1) 1	(13) 16	(7) 17	(1) 2	(5) 14	(3) 16	(1) 5	(8) 43	(5) 48	(1) 4	(11) 30	(6) 34
24·0–24·4		—	(5) 12	(3) 12	(0) 1	(4) 38	(2) 39	—	(2) 2	(1) 2	—	(6) 17	(3) 17	(0) 1	(3) 17	(2) 18	(0) 1	(5) 15	(3) 16
24·5–24·9		—	(2) 4	(1) 4	—	(1) 12	(1) 12	—	—	—	—	(1) 2	(0) 2	—	(1) 5	(1) 5	—	(1) 3	(1) 3
25·0–25·4		—	—	—	—	—	—	—	—	—	—	(0) 1	(0) 1	—	—	—	—	(0) 1	(0) 1
25·5–25·9		—	—	—	—	(0) 1	(0) 1	—	—	—	—	—	—	—	—	—	—	—	—
26·0–26·4		—	—	—	—	(0) 2	(0) 2	—	—	—	—	—	—	—	—	—	—	—	—
Total No. of Fish.		221	229	450	609	991	1,600	126	124	250	217	283	500	379	521	900	269	281	550

NO SAMPLES TAKEN

N.B.—Numbers in brackets (above) indicate percentage frequencies.

TABLE 12 (*b*).

LENGTH FREQUENCIES OF COMMERCIAL CATCHES OF PILCHARDS, 1955.

Length Groups.	AUGUST.			SEPTEMBER.			OCTOBER.			NOVEMBER.			DECEMBER.	YEAR.		
	M.	F.	T.	M.	F.	T.	M.	F.	T.	M.	F.	T.		M.	F.	T.
cm															(0)	(0)
18·0–18·4	—	—	—	—	—	—	—	—	—	—	—	—		—	1	1
		(0)	(0)												(0)	(0)
18·5–18·9	—	1	1	—	—	—	—	—	—	—	—	—		—	1	1
															(0)	(0)
19·0–19·4	—	—	—	—	—	—	—	—	—	—	—	—		—	2	2
	(0)		(0)	(0)		(0)								(0)		(0)
19·5–19·9	1	—	1	1	—	1	—	—	—	—	—	—		3	—	3
	(1)	(0)	(1)				(4)		(2)	(9)		(4)		(1)	(0)	(0)
20·0–20·4	5	1	6	—	—	—	1	—	1	2	—	2		18	5	23
	(4)	(1)	(2)	(3)	(0)	(1)	(7)	(4)	(6)	(14)		(6)		(4)	(1)	(2)
20·5–20·9	16	6	22	13	1	14	2	1	3	3	—	3		103	20	123
	(15)	(5)	(9)	(12)	(3)	(6)	(19)	(13)	(16)	(27)	(7)	(16)		(16)	(4)	(9)
21·0–21·4	54	27	81	51	19	70	5	3	8	6	2	8		439	145	584
	(27)	(12)	(18)	(21)	(7)	(12)	(33)	(26)	(30)	(32)	(22)	(26)		(27)	(12)	(18)
21·5–21·9	101	68	169	93	55	148	9	6	15	7	6	13		725	442	1,167
	(27)	(26)	(26)	(33)	(21)	(25)	(19)	(9)	(14)	(14)	(32)	(24)		(26)	(25)	(25)
22·0–22·4	98	153	251	144	161	305	5	2	7	3	9	12		706	945	1,651
	(16)	(20)	(18)	(20)	(24)	(23)	(15)	(17)	(16)	(4)	(14)	(10)		(16)	(22)	(20)
22·5–22·9	58	114	172	90	180	270	4	4	8	1	4	5		434	837	1,271
	(6)	(22)	(16)	(9)	(25)	(19)	(4)	(17)	(10)		(14)	(8)		(7)	(21)	(16)
23·0–23·4	22	128	150	40	193	233	1	4	5	—	4	4		191	819	1,010
	(3)	(10)	(7)	(2)	(12)	(9)		(9)	(4)		(7)	(4)		(2)	(10)	(7)
23·5–23·9	11	60	71	9	93	102	—	2	2	—	2	2		55	389	444
	(1)	(3)	(2)	(0)	(5)	(3)		(4)	(2)		(4)	(2)		(0)	(4)	(2)
24·0–24·4	2	15	17	1	40	41	—	1	1	—	1	1		6	158	164
	(0)	(1)	(1)		(2)	(1)								(0)	(1)	(1)
24·5–24·9	1	5	6	—	12	12	—	—	—	—	—	—		1	43	44
		(0)	(0)		(0)	(0)									(0)	(0)
25·0–25·4	—	3	3	—	3	3	—	—	—	—	—	—		—	8	8
				(0)		(0)								(0)	(0)	(0)
25·5–25·9	—	—	—	1	—	1	—	—	—	—	—	—		1	1	2
															(0)	(0)
26·0–26·4	—	—	—	—	—	—	—	—	—	—	—	—		—	2	2
TOTAL NO. OF FISH	369	581	950	443	757	1,200	27	23	50	22	28	50		2,682	3,818	6,500

NO SAMPLES TAKEN

N.B.—Numbers in brackets (above) indicate percentage frequencies.

Reprint from "Commerce & Industry", May, 1957

TABLE 13.

MEAN PERCENTAGE LENGTH FREQUENCY FOR MALE AND FEMALE PILCHARDS PER LENGTH GROUP COMBINED FOR THE SIX YEAR PERIOD, 1950–55.

Length Groups.	1950.	1951.	1952.	1953.	1954.	1955.	Mean.
cm							
14·0–14·4	0	0	0	0	0	0	0
14·5–14·9	0	0	0	1	0	0	0
15·0–15·4	0	0	0	1	0	0	0
15·5–15·9	0	0	0	1	0	0	0
16·0–16·4	0	0	0	1	0	0	0
16·5–16·9	0	0	0	0	0	0	0
17·0–17·4	0	0	0	1	0	0	0
17·5–17·9	0	1	1	0	0	0	0
18·0–18·4	1	1	2	1	0	0	1
18·5–18·9	2	1	3	1	0	0	1
19·0–19·4	4	1	5	1	0	0	2
19·5–19·9	4	1	7	1	1	0	2
20·0–20·4	5	2	8	3	3	0	4
20·5–20·9	6	5	7	6	5	2	5
21·0–21·4	6	11	8	13	9	9	9
21·5–21·9	7	12	11	16	15	18	13
22·0–22·4	13	13	14	18	23	25	18
22·5–22·9	16	16	13	14	20	20	17
23·0–23·4	15	15	9	11	14	16	13
23·5–23·9	11	11	6	6	7	7	8
24·0–24·4	6	6	3	3	2	2	4
24·5–24·9	3	3	1	1	1	1	2
25·0–25·4	1	1	0	0	0	0	0
25·5–25·9	0	0	0	0	0	0	0
26·0–26·4	0	0	0	0	0	0	0

TABLE 14 (*a*).

LENGTH FREQUENCIES OF COMMERCIAL CATCHES OF PILCHARDS IN NATAL, 1951.

Length Groups.	JUNE.					
	M		F		T	
	N	P	N	P	N	P
cm						
15·5–15·9...	—		1	(4)	1	(2)
16·0–16·4...	—		—		—	
16·5–16·9...	3	(16)	3	(14)	6	(15)
17·0–17·4...	9	(47)	5	(23)	14	(34)
17·5–17·9...	6	(32)	9	(41)	15	(37)
18·0–18·4...	—		3	(14)	3	(7)
18·5–18·9...	1	(5)	—		1	(2)
19·0–19·4...	—		—		—	
19·5–19·9...	—		1	(4)	1	(2)
20·0–20·4...	—		—		—	
Total No. of Fish.....	19		22		41	

TABLE 14 (*b*).

LENGTH FREQUENCIES OF COMMERCIAL CATCHES OF PILCHARDS IN NATAL, 1954.

Length Groups.	JUNE.					
	M		F		T	
	N	P	N	P	N	P
cm						
14·5–14·9...	—		2	(4)	2	(2)
15·0–15·4...	7	(10)	2	(4)	9	(7)
15·5–15·9...	7	(10)	8	(14)	15	(12)
16·0–16·4...	9	(13)	4	(7)	13	(10)
16·5–16·9...	9	(13)	6	(11)	15	(12)
17·0–17·4...	3	(4)	1	(2)	4	(3)
17·5–17·9...	6	(8)	2	(4)	8	(6)
18·0–18·4...	7	(10)	4	(7)	11	(9)
18·5–18·9...	7	(10)	11	(20)	18	(14)
19·0–19·4...	7	(10)	9	(16)	16	(13)
19·5–19·9...	7	(10)	5	(9)	12	(10)
20·0–20·4...	2	(3)	1	(2)	3	(2)
Total No. of Fish.....	71		55		126	

TABLE 14 (*c*).

LENGTH FREQUENCIES OF COMMERCIAL CATCHES OF PILCHARDS IN NATAL, 1955.

Length Groups.	JUNE.					
	M		F		T	
	N	P	N	P	N	P
cm						
15·5–15·9...	6	(5)	1	(1)	7	(3)
16·0–16·4...	12	(10)	8	(6)	20	(8)
16·5–16·9...	26	(22)	16	(12)	42	(17)
17·0–17·4...	33	(28)	28	(21)	61	(24)
17·5–17·9...	7	(6)	29	(22)	36	(14)
18·0–18·4...	11	(9)	13	(10)	24	(10)
18·5–18·9...	8	(7)	15	(11)	23	(9)
19·0–19·4...	7	(6)	14	(11)	21	(8)
19·5–19·9...	5	(4)	6	(4)	11	(4)
20·0–20·4...	1	(1)	3	(2)	4	(2)
20·5–20·9...	—		—		—	
21·0–21·4...	—		—		—	
21·5–21·9...	—		—		—	
22·0–22·4...	1	(1)	—		1	(0)
Total No. of Fish.....	117		133		250	

PLATE 1

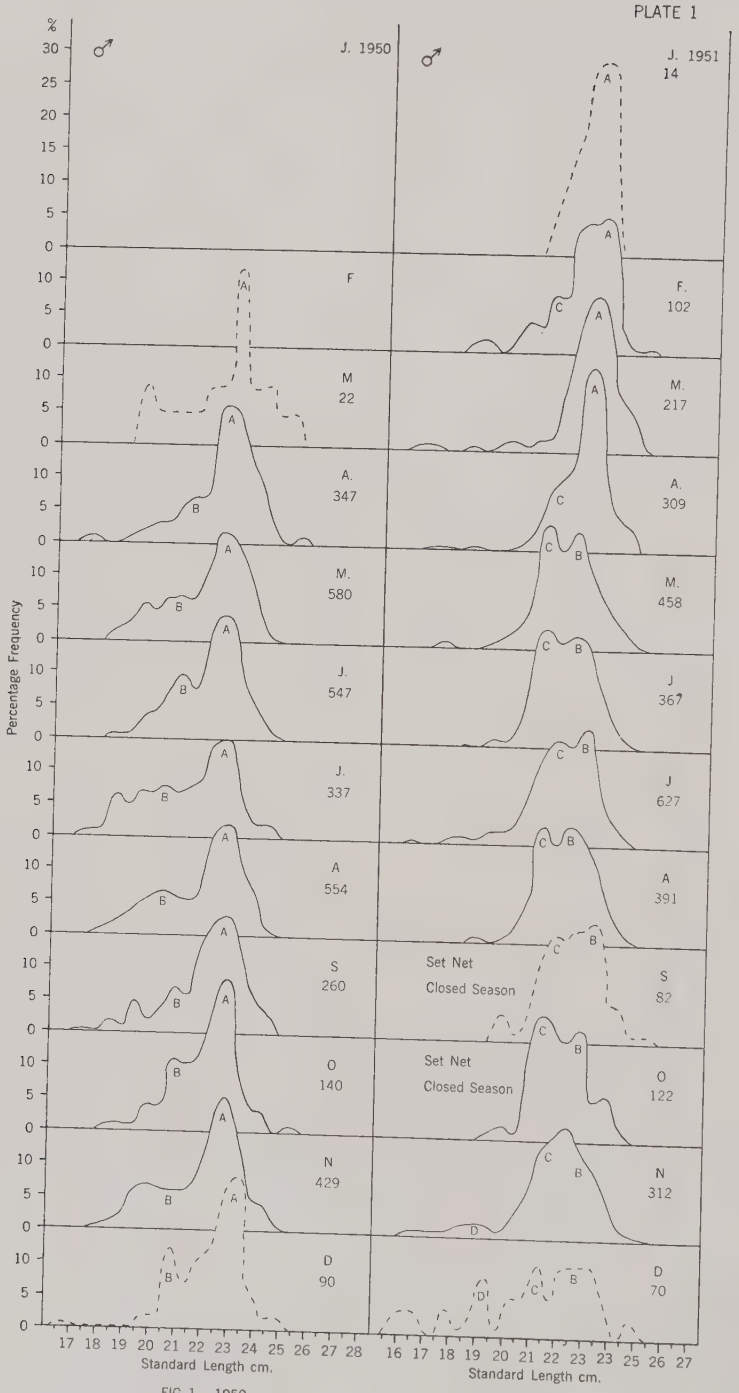


FIG. 1 1950.

FIG. 2 1951

LENGTH FREQUENCIES OF MALE PILCHARDS, 1950 AND 1951.

N.B.1. Figures below months indicate numbers of fish examined.

2. Graphs dotted when under 100 fish were examined

Trigsurvey. 1957.

Government Printer, 1957

PLATE 2

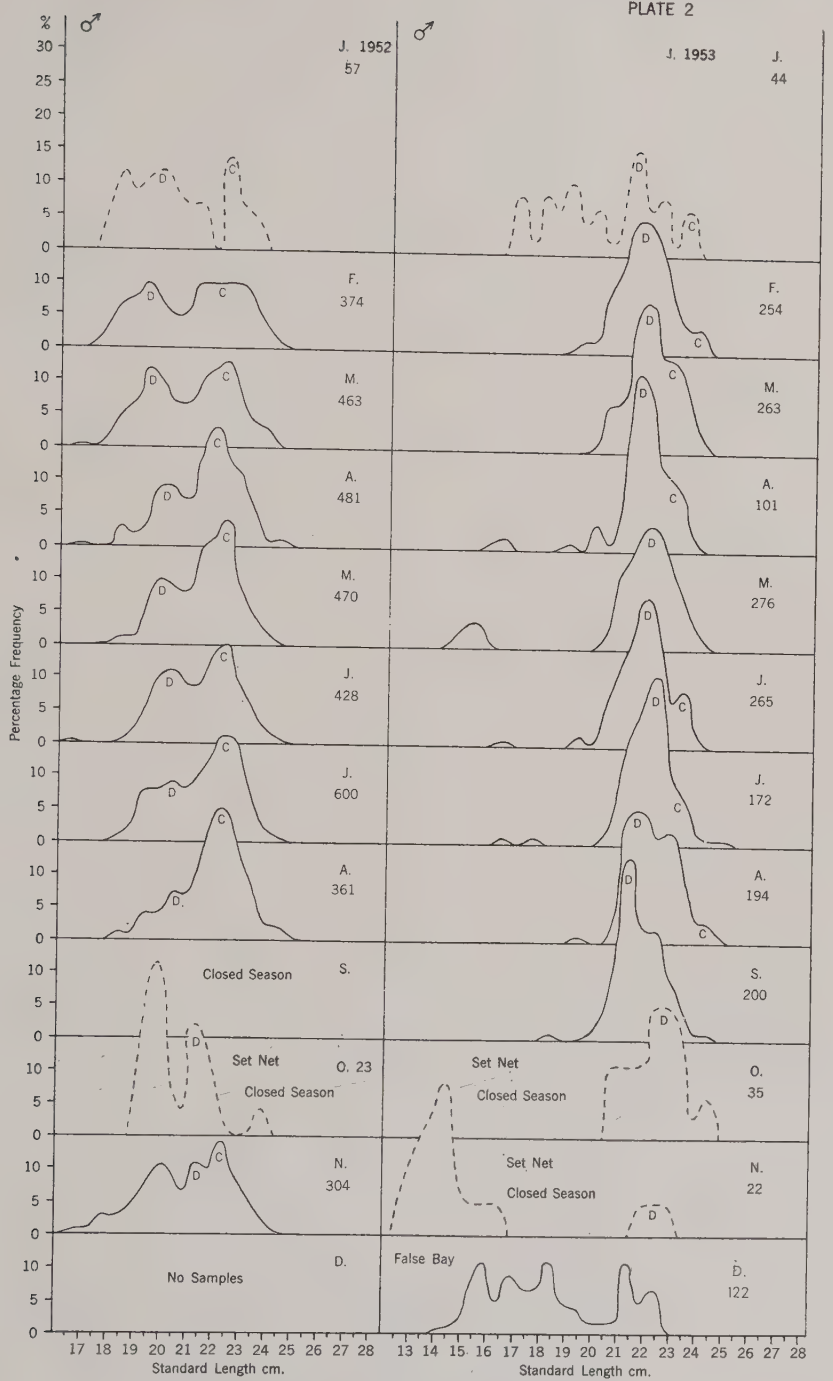


FIG. 1 1952

FIG 2 1953

LENGTH FREQUENCIES OF MALE PILCHARDS 1952 AND 1953.

N.B. Figures below months indicate numbers of fish examined

2. Graphs dotted when under 100 fish were examined.

Trigsurvey 1957. Government Printer, 1957.

PLATE 3

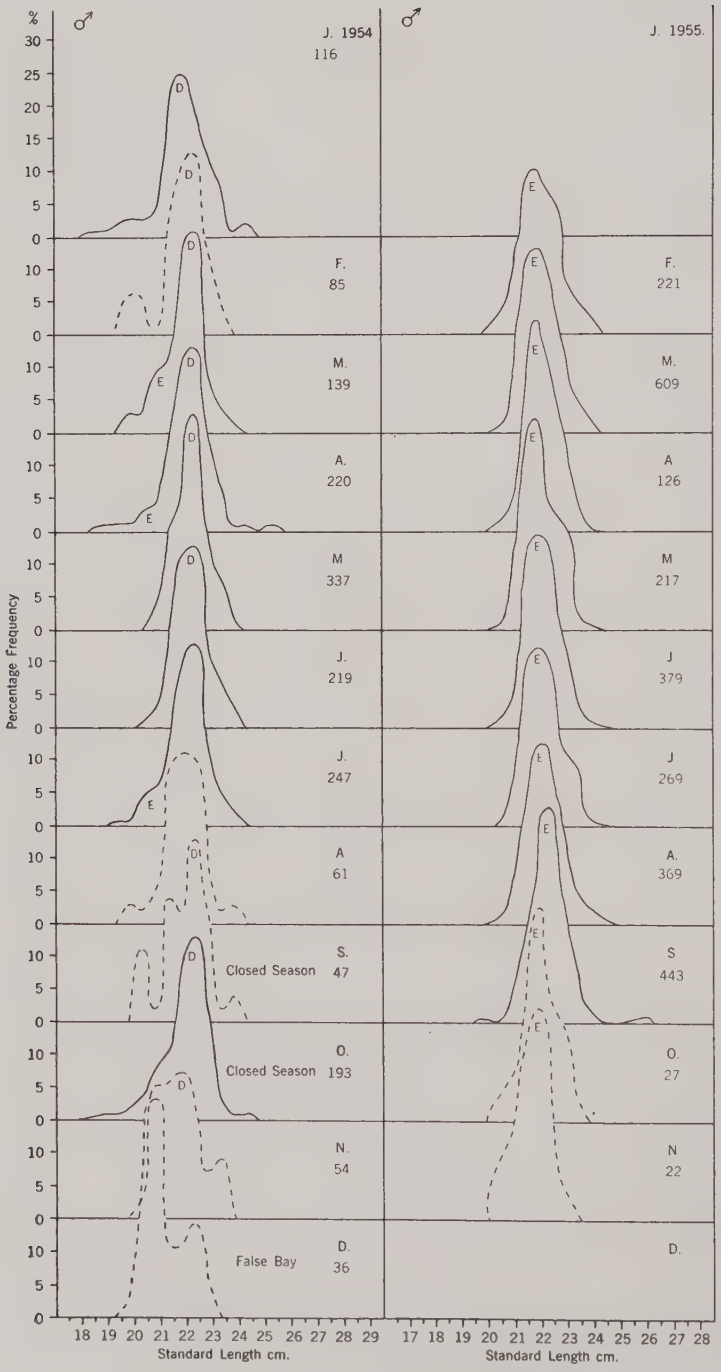


FIG. 1 1954. FIG. 2 1955.

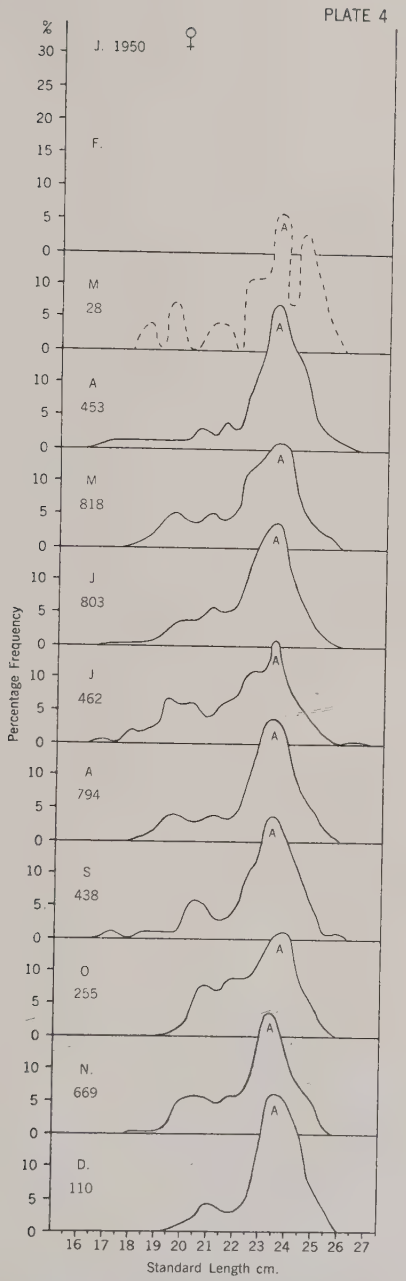
LENGTH FREQUENCIES OF MALE PILCHARDS, 1954 AND 1955.

N.B.1. Figures below months indicate numbers of fish examined.

2. Graphs dotted when under 100 fish were examined.

Trigsurvey, 1957. Government Printer, 1957.

PLATE 4



LENGTH FREQUENCIES OF FEMALE PILCHARDS, 1950

N.B. 1. Figures below months indicate numbers of fish examined

2. Graphs dotted when under 100 fish were examined

Trigsurvey 1957. Government Printer 1957

PLATE 5

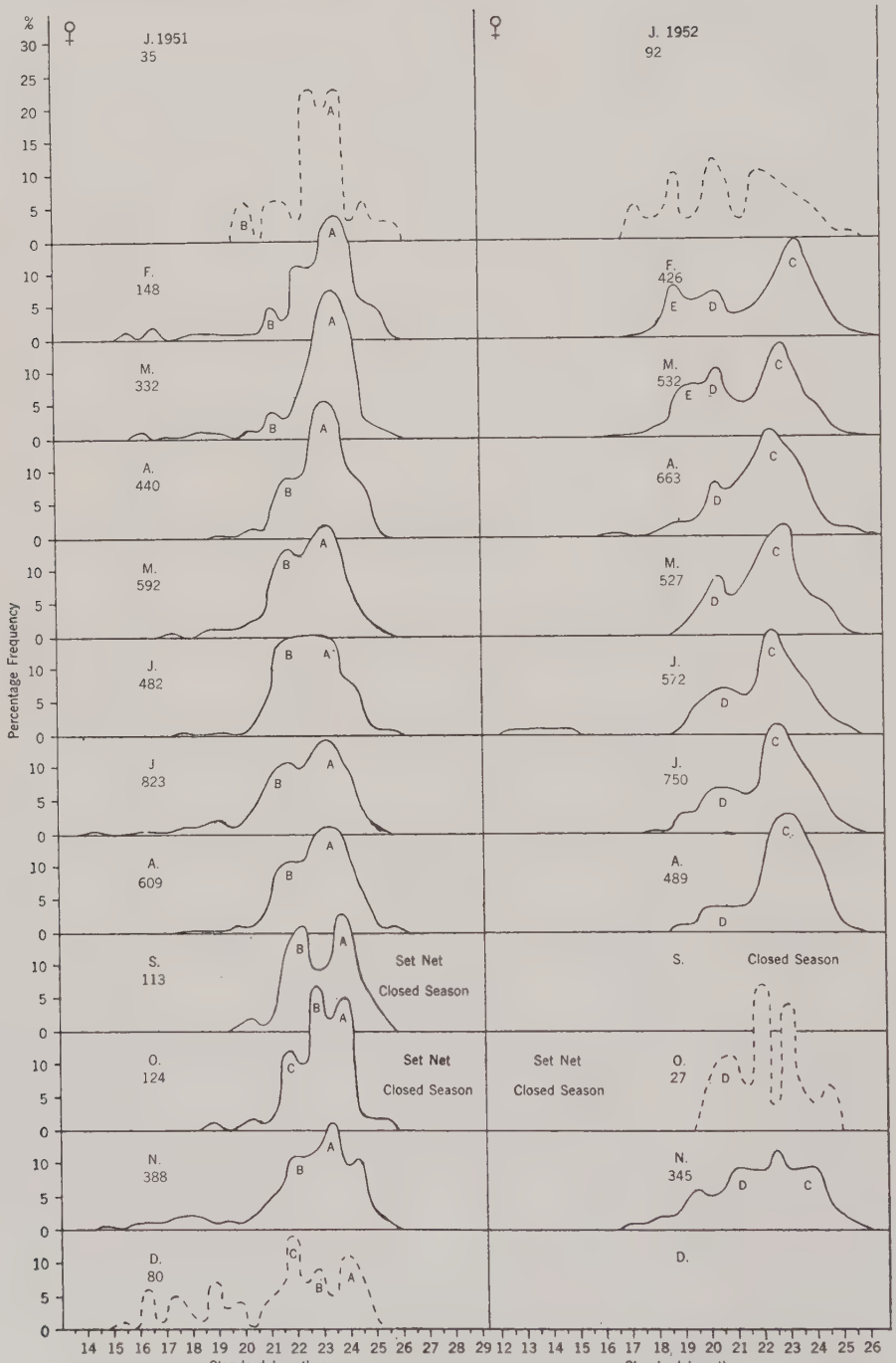


FIG. 1 1951. FIG. 2 1952

LENGTH FREQUENCIES OF FEMALE PILCHARDS, 1951 AND 1952.

N.B. 1. Figures below months indicate numbers of fish examined.

2. Graphs dotted when under 100 fish were examined.

Trigsurvey, 1957. Government Printer, 1957.

PLATE 6

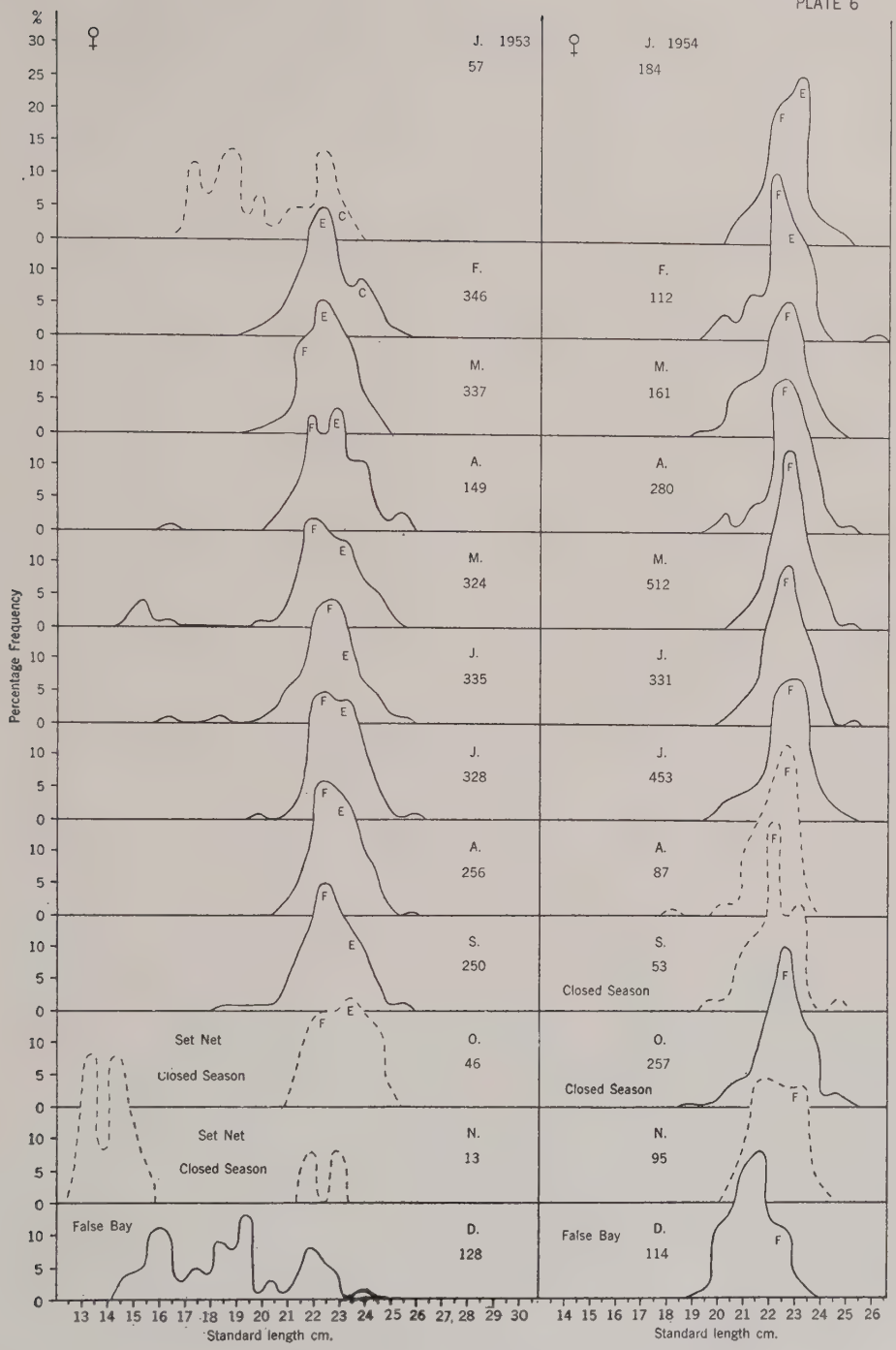


FIG. 1 1953

FIG. 2 1954

LENGTH FREQUENCIES OF FEMALE PILCHARDS, 1953 AND 1954.

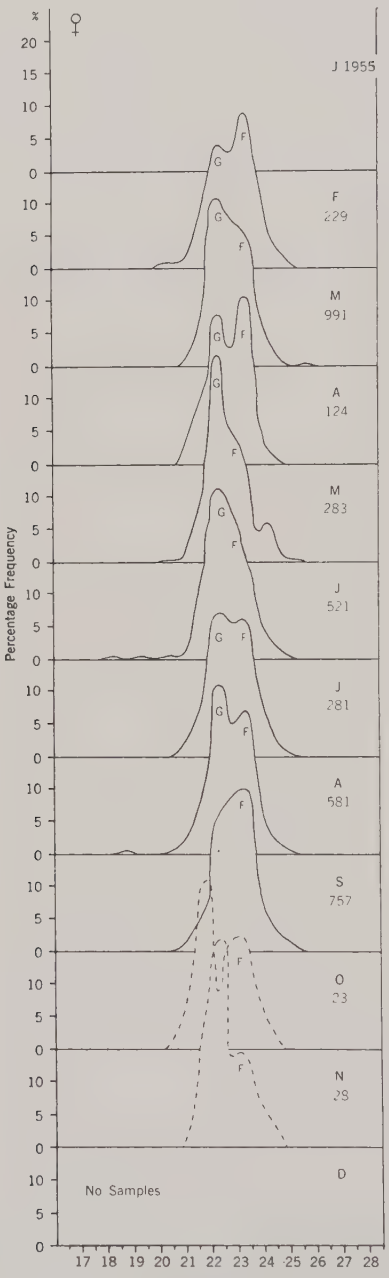
N.B. 1. Figures below months indicate numbers of fish examined.

2. Graphs dotted when under 100 fish were examined.

T. Fig. Survey, 1957.

Government Printer, 1957

PLATE 7



LENGTH FREQUENCIES OF FEMALE PILCHARDS, 1955

N.B. 1. Figures below months indicate numbers of fish examined.
2. Graphs dotted when under 100 fish were examined

Trigsurvey. 1957. Government Printer 1957

PLATE 8

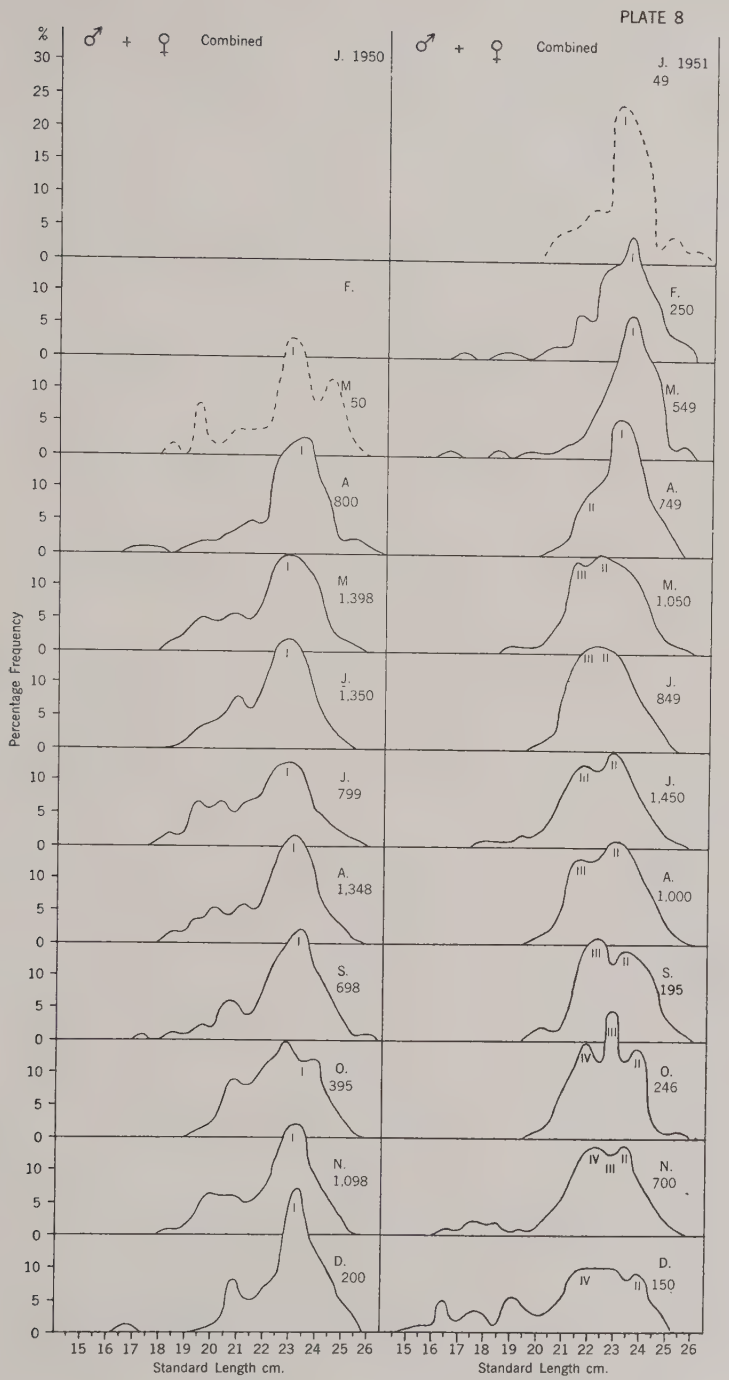


FIG. 1 1950. FIG. 2 1951

LENGTH FREQUENCIES OF MALE AND FEMALE PILCHARDS COMBINED, 1950 AND 1951.

N.B.1. Figures below months indicate numbers of fish examined.

2. Graphs dotted when under 100 fish were examined.

Trigsurvey, 1957. Government Printer, 1957

PLATE 9

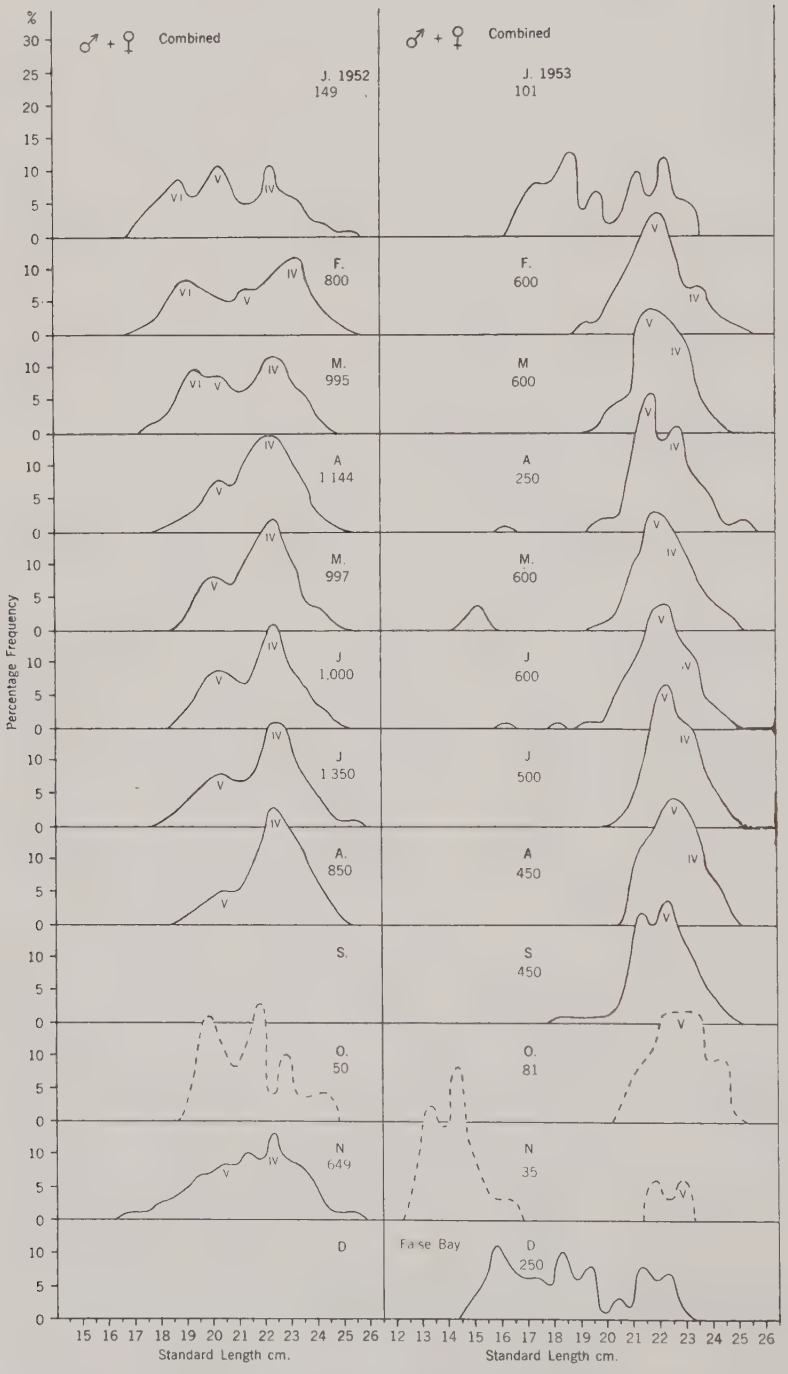


FIG. 1 1952 FIG. 2 1953

LENGTH FREQUENCIES OF MALE AND FEMALE PILCHARDS COMBINED, 1952 AND 1953

N.B.1. Figures below months indicate numbers of fish examined

2. Graphs dotted when under 100 fish were examined

Trigsurvey, 1957 Government Printer, 1957

PLATE 10

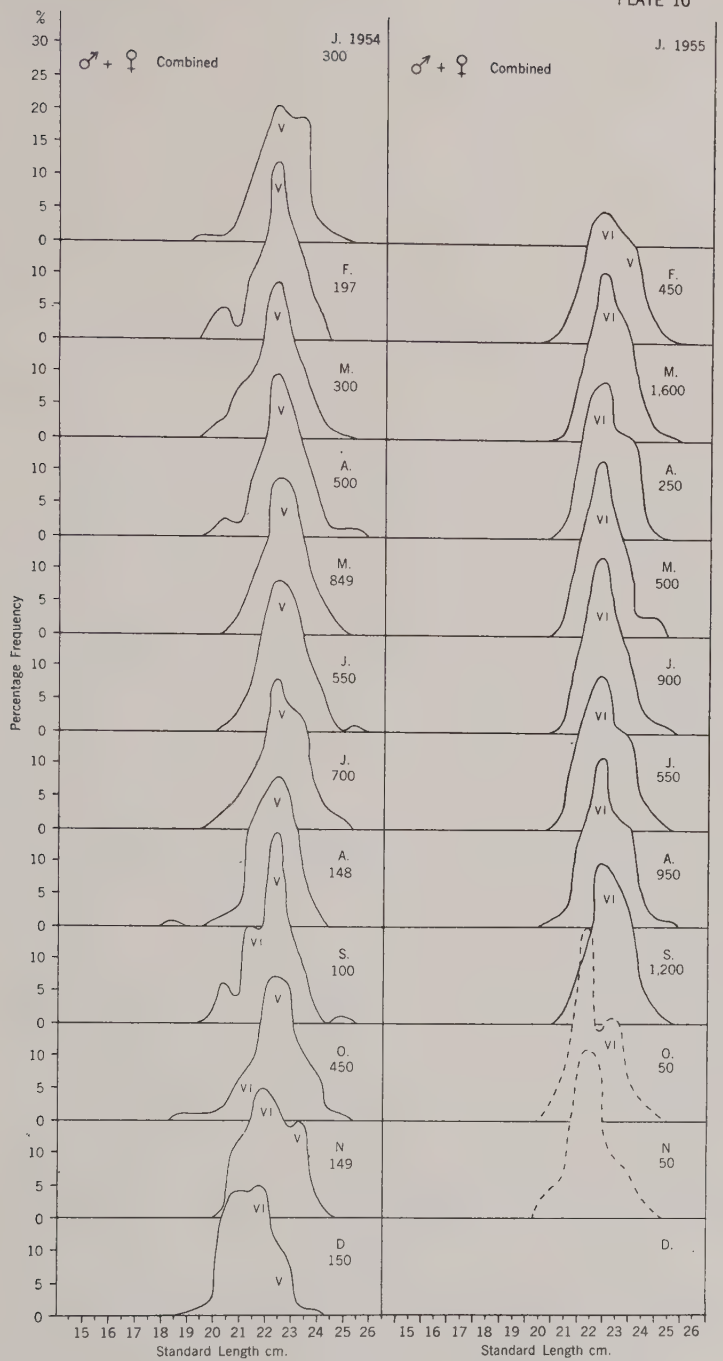


FIG. 1 1954 FIG. 2 1955

LENGTH FREQUENCIES OF MALE AND FEMALE PILCHARDS COMBINED, 1954 AND 1955.

N.B.1. Figures below months indicate numbers of fish examined.

2. Graphs dotted when under 100 fish were examined

Trgsurvey 1957 Government Printer, 1957

PLATE 11.

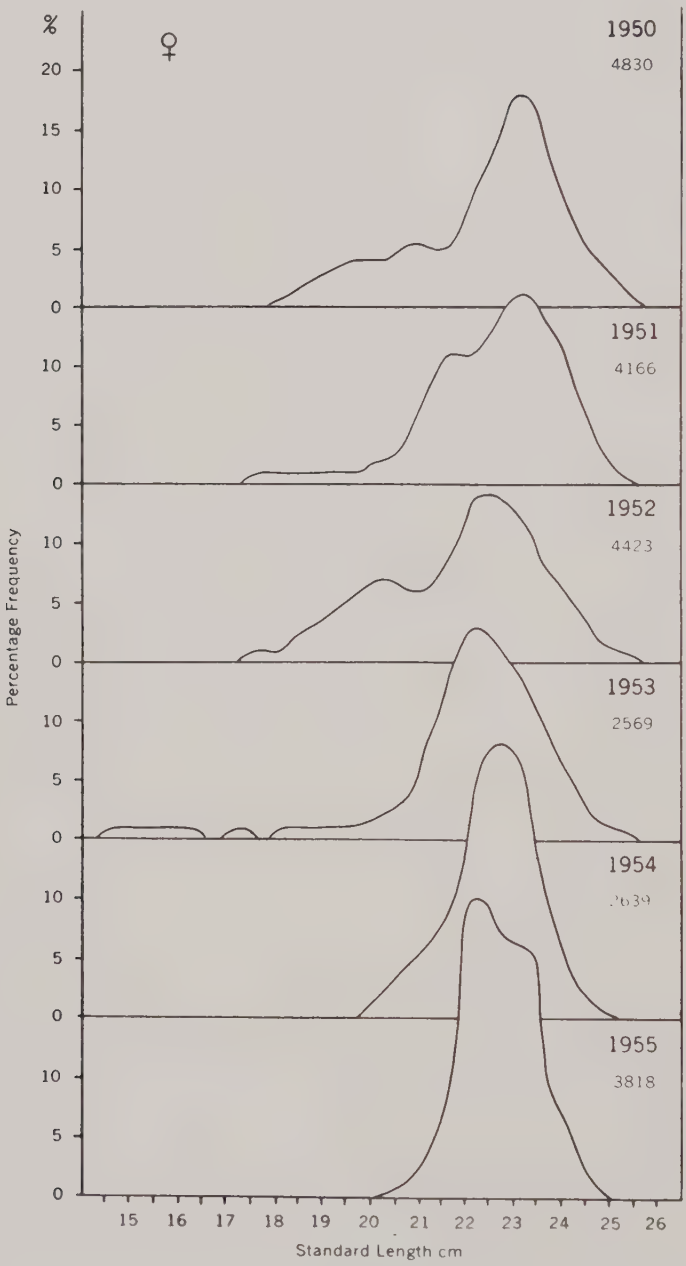


FIG.2. Females

LENGTH FREQUENCIES PER YEAR FOR PILCHARDS, 1950-55

NB. Figures below years indicate numbers of fish examined

Trigsurvey 1957. Goverment Printer, 1957

PLATE 11.

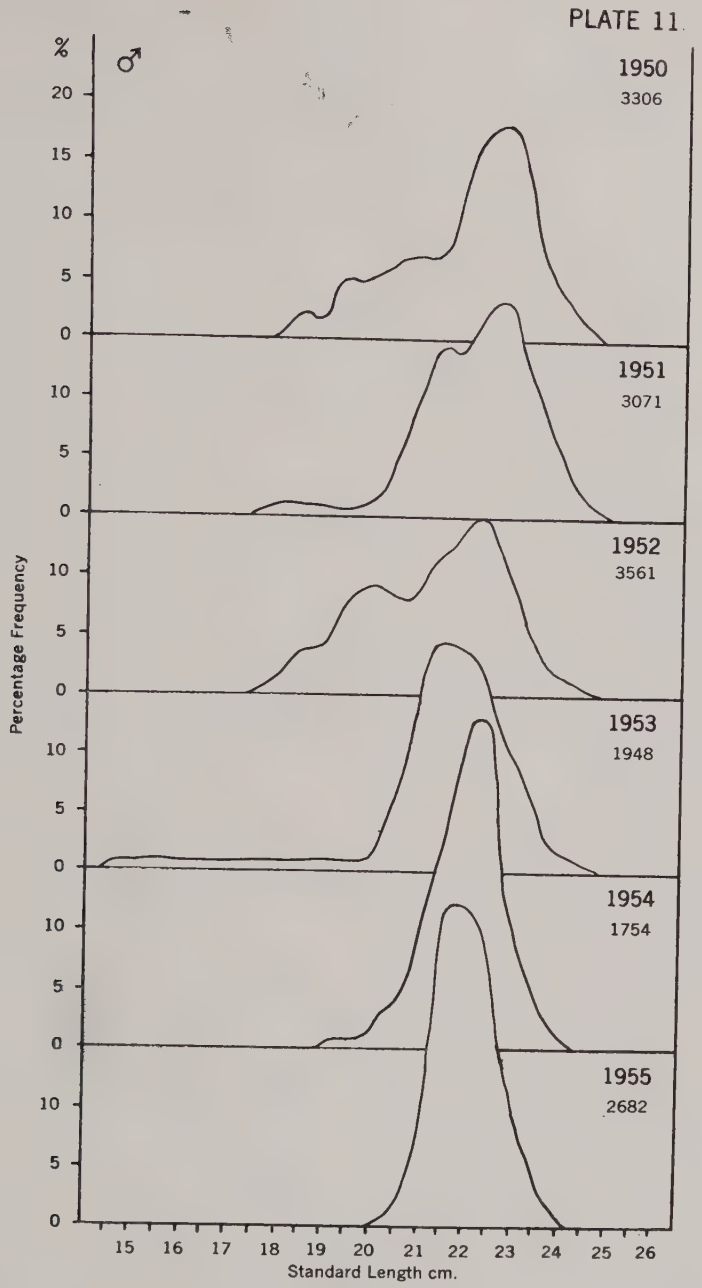


FIG. 1. Males

LENGTH FREQUENCIES PER YEAR FOR PILCHARDS, 1950-55.

NB. Figures below years indicate numbers of fish examined.

Trigsurvey, 1957

Government Printer, 1957.

PLATE 11.

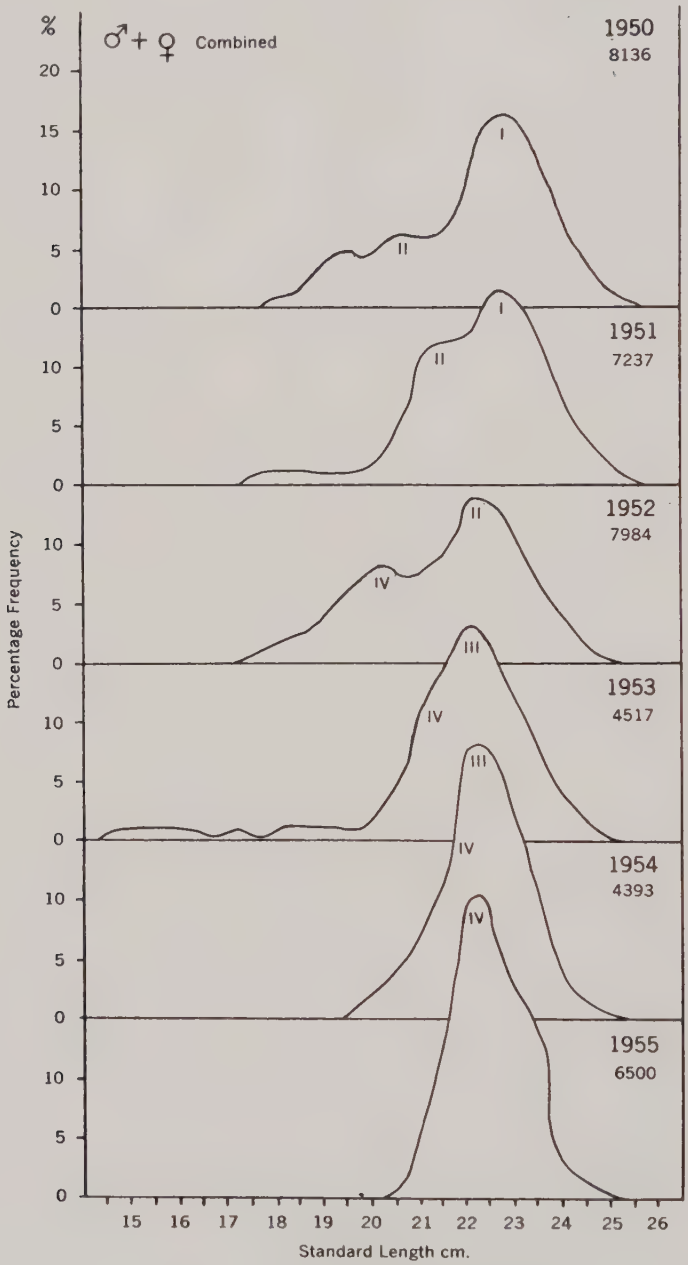


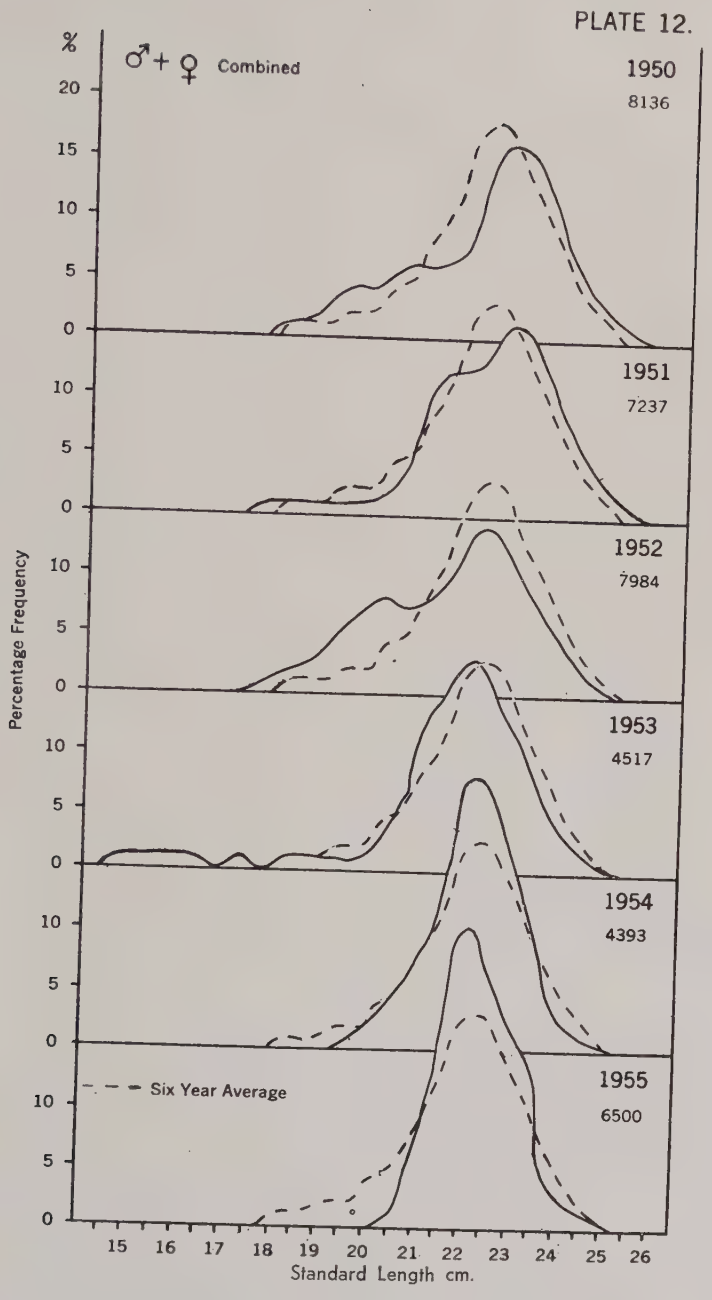
FIG. 3. Males and Females combined.

LENGTH FREQUENCIES PER YEAR FOR PILCHARDS, 1950-55.

NB. Figures below years indicate numbers of fish examined.

Trigsurvey, 1957. Government Printer, 1957.

PLATE 12.



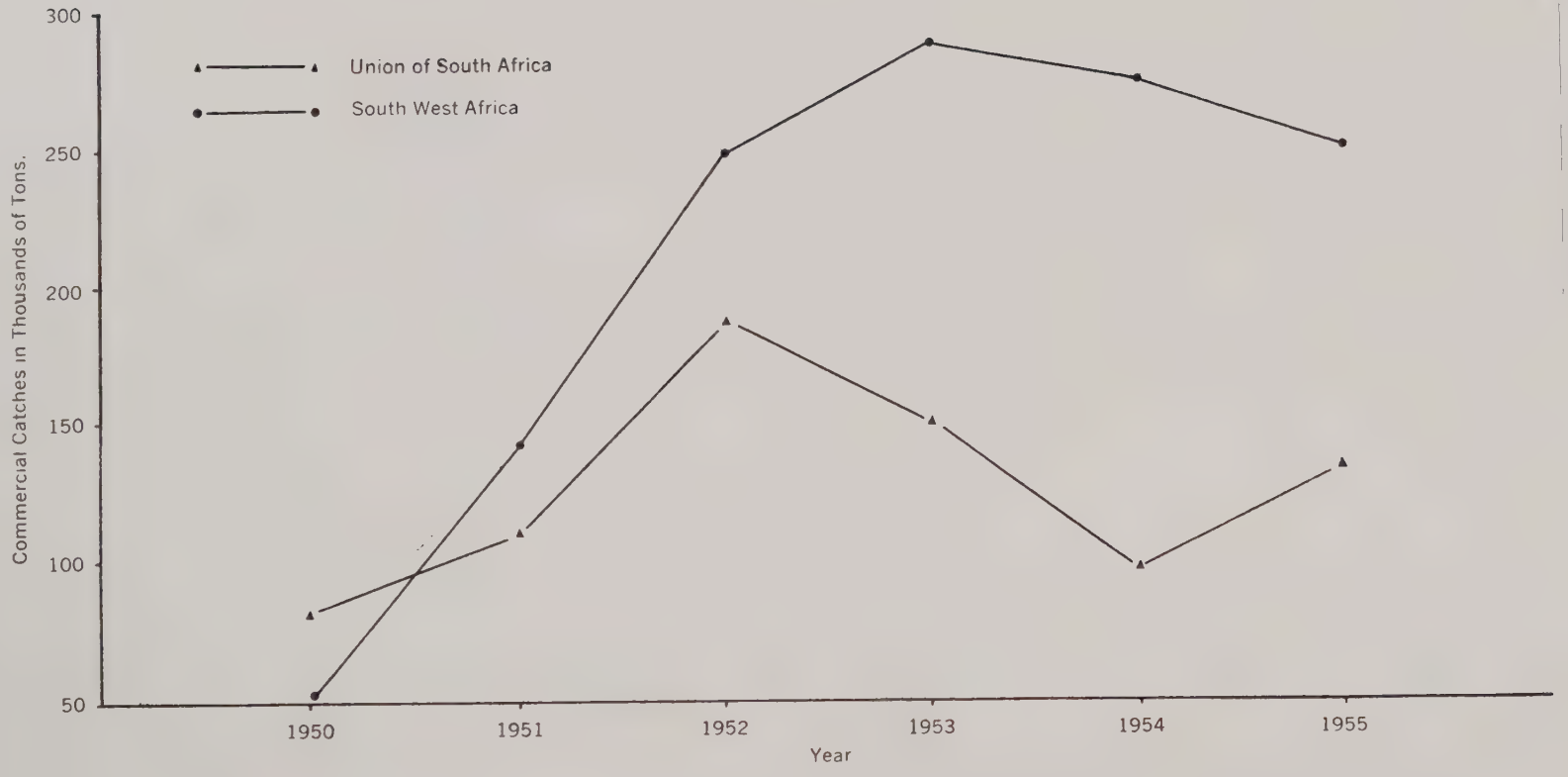
COMPARISON OF EACH YEAR WITH THE SIX YEAR AVERAGE

NB. Figures below years indicate numbers of fish examined.

Trigsurvey, 1957. Government Printer, 1957

Reprint from "Commerce & Industry", May, 1957

PLATE 13

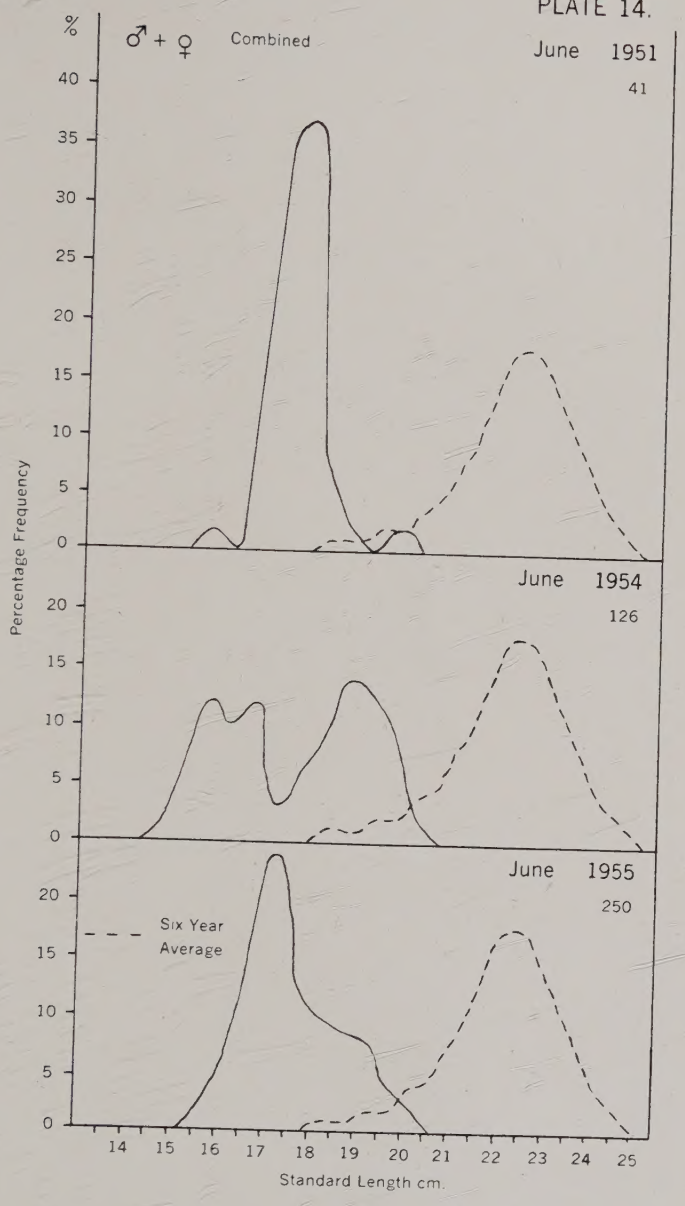


THE COMMERCIAL CATCHES OF PILCHARDS FOR THE UNION OF SOUTH AFRICA AND SOUTH WEST AFRICA 1950–55

Trigsurvey, 1957

Government Printer 1957

PLATE 14.



Males and Females combined.

LENGTH FREQUENCIES OF NATAL PILCHARDS AND SIX YEAR AVERAGE OF WEST COAST PILCHARDS.

NB. Figures below month and year indicate numbers of fish examined.

Trigsurvey. 1957

Government Printer. 1957